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THE MEDICAL JOURNAL OF AUSTRALIA

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THE VALUE OF BIOCHEMICAL METHODS IN THE CONTROL OF INTRAVENOUS INFUSIONS.

By A. E. F. SHAW,
Major, Australian Army Medical Corps,

AND

A. DALY SMITH,
Major, Australian Army Medical Corps,

THE haphazard methods of control which have characterized the use of intravenous infusions in the past have also had their attendant dangers, which are obvious to clinician and pathologist alike. In an attempt to avoid the Scylla of anasarca and pulmonary œdema on the one hand, and the Charybdis of extreme dehydration on the other, various formulæ have been put forward from time to time as offering a means of regulation of the different types of fluids in common use. Unfortunately even when supplemented with estimations of the hæmoglobin and blood chloride values, these formulæ have proved far from adequate, and the need for some further supplementary investigation, such as a plasma protein estimation, has been apparent for some time. This need became an urgent one with the increase in the use of more expensive and less readily obtainable fluids, such as plasma and serum and the various synthetic amino acid preparations which have recently been introduced.

In the past the time-consuming nature of the usual methods of plasma protein estimation has proved an effective obstacle to the adoption of this investigation as a routine measure. This difficulty has been removed with the introduction of procedures such as that employed in the falling drop method of Barbour and Hamilton (1926), and it now appears that a truly composite picture of the cellular, colloid and electrolyte elements of whole blood in health and disease can be obtained by the use of this investigation in conjunction with the hæmatocrit reading and plasma chloride estimation. Accordingly, although it is realized that for completeness of information it would be desirable to have some knowledge of the total blood volume as well as of the fluid, colloid and electrolyte reserves of the body, we have considered it worthwhile investigating just what would be the value of the three relatively simple investigations in the regulation of intravenous infusions. These observations have now been employed by us in rather more than fifty cases, and it is thought that a report of the findings to date may be of some value to those interested. However, as many of the cases investigated merely confirm principles already determined by others in the same series, it is felt that the presentation of a selected representative sample would be more useful than a rambling presentation of all the cases in which the investigations were performed. It is by no means claimed that the treatment employed in these cases was ideal—in the light of our present experience we should have been inclined to alter it in quite a number of instances; but we do consider that these cases are of importance in indicating the response to the type of treatment employed, whether good or bad.

Standards.

The following values have been regarded by us as representing the normal range for the methods used in these investigations.

A hæmatocrit reading of 40% to 45% was considered within normal limits. (The commonest normal value in the cases considered was 44%.) The method used was the direct one of centrifugation of heparinized blood, as described by Kretchmar, until no further packing of the red cells occurred.

The plasma protein content should be from 6·5 to 7·5 grammes per 100 cubic centimetres of plasma. The falling drop method of Barbour and Hamilton was employed on plasma obtained from centrifuged samples of heparinized blood. In assessing the gravity of hypoproteinæmia, we chose as the critical point 5·3 grammes of protein per 100 cubic centimetres of plasma, which is the level given by Van Slyke below which an œdema of gravitational type may be expected to ensue.

The plasma chloride content should lie between 560 and 620 milligrammes per 100 cubic centimetres of plasma, the standard Whitehorn method of estimation being used.

Reports of Cases.

CASE I.—The condition in this case was post-operative surgical shock. A male patient, aged forty-eight years, had a left hydronephrosis secondary to a large ureteric

calculus, which was removed at operation on December 28, 1942, under ethyl chloride and "open" ether anæsthesia. His condition deteriorated steadily during the ensuing three days, at which juncture intravenous therapy was instituted. The results of laboratory investigations and treatment may be tabulated as follows (Table I):

The laboratory findings on December 31, 1942, indicated a condition of dehydration probably combined with plasma loss, and not one of simple dehydration; this was shown by the fact that the increase in the hæmatocrit value was greater proportionately than that in the plasma protein content. This was speedily remedied by the fluids given intravenously. Administration of serum was considered necessary on January 1, 1943, to help reduce the hæmatocrit value without unduly upsetting the plasma protein percentage. On January 1 an early stage of the development of hæmoconcentration became apparent; this was presumably due to both plasma loss and dehydration. The administration of serum appeared to be the best means to correct this, in view of the past history. The findings on January 6 indicate a concentration of plasma proteins and a lowering of the hæmatocrit value consequent upon administration of an excess of serum. This did not appear to have any deleterious effect upon the patient's condition.

CASE II.—Case II was one of hypoproteinæmia in an asthmatic suffering from an intestinal obstruction. The patient was a male, aged thirty-two years, who had had asthma for six years. At operation on December 16, 1942, it was found that eighteen inches of the lower portion of the ileum were dark and gangrenous. An end-to-end anastomosis was performed after adhesions had been freed, intravenous anæsthesia with "Pentothal Sodium" and nitrous oxide and oxygen anæsthesia being employed. Subsequent treatment by the intravenous administration of serum and glucose and saline solution, accompanied by intermittent duodenal suction until December 19, was quite successful. On December 22—that is, on the sixth day after operation—there were signs of intestinal obstruction of an intermittent type. During the ensuing period until the second operation on December 25 the patient's condition steadily deteriorated. His progress was as shown in Table II.

The appearance of gravitational œdema associated with severe hypoproteinæmia is to be noted; this was remedied by the administration of whole blood. The raised icteric index is a common finding subsequent to blood transfusion.

CASE III.—The patient in Case III was suffering from slight burns. He was a male, aged forty-two years, and second and third degree petrol burns were present on the face, neck and hands. He was admitted to hospital on September 23, 1942, at 8 p.m. The burnt areas were cleansed with ether soap and saline solution, and sulphanilamide powder and *tulle gras* were subsequently applied. One hour after his admission to hospital the hæmatocrit reading was 45%; the plasma protein content was 6·4 grammes per 100 cubic centimetres, and remained at that figure. At 9 a.m. on the next morning the hæmatocrit reading was

TABLE I.

Date.	Hæmatocrit Reading.	Plasma Protein. (Grammes per 100 Cubic Centimetres.)	Plasma Chlorides. (Milligrammes per 100 Cubic Centimetres.)	Intravenous Therapy.	Remarks.
31/12/43	61%	8·2	570	1 litre 5% glucose in normal saline solution. 1 litre 1/5 normal saline solution and glucose. 1 litre serum. 1 litre 1/5 normal saline solution and glucose.	Blood urea level, 56 milligrammes per 100 cubic centimetres. Immediate improvement in condition following administration of serum.
1/1/43	49%	6·8	590	1 litre 5% glucose in normal saline solution. 1 litre serum.	Condition greatly improved.
2/1/43 4/1/43	46%	6·8	590	1 litre 1/5 normal saline solution and glucose.	Improvement maintained. "Burst" abdomen repaired under cyclopropane carbon dioxide absorption anæsthesia at 7 a.m.
Shortly after operation	50%	7·2	610	2 litres serum.	Condition good.
5/1/43	47%	7·6	610	2 litres serum.	Serum was given on the assumption that plasma loss might still be proceeding. Condition quite good.
6/1/43	43%	7·8	610		Condition maintained.

TABLE II.

Date.	Hæmatocrit Reading.	Plasma Protein. (Grammes per 100 Cubic Centimetres.)	Plasma Chlorides. (Milligrammes per 100 Cubic Centimetres.)	Other Investigations.	Intravenous Therapy.	Remarks.
24/12/42					1 litre normal saline solution. 1 litre glucose and 1/5 normal saline solution.	Intravenous therapy recommenced. Miller-Abbott tube inserted. Condition only fair.
25/12/42 9.45 p.m.	31%	5·3	610		4 litres glucose and 1/5 normal saline solution. 1 pint blood.	Abdomen reopened at 1.45 p.m.; distended bowel and adhesions. Double ileostomy performed after freeing of adhesions.
26/12/42	36%	5·3	600	Icteric index, 22.	1 pint blood. 2 litres glucose and 1/5 normal saline solution. 1 pint blood. 1 litre glucose and 1/5 normal saline solution.	Gravitational œdema present. Condition fair.
8.30 p.m.	39%	5·7				
27/12/42	37%	5·6	570	Hæmoglobin value, 12·5 grammes *per centum*. Erythrocytes, 4,000,000 per cubic millimetre; leucocytes, 20,000 per cubic millimetre. Icteric index, 21.	2 pints blood.	Condition improved. Œdema less. Miller-Abbott tube replaced by Rehfuss tube.
28/12/42	43%	5·9	550	Icteric index, 18.	1 litre 5% glucose solution.	Improvement maintained. Intravenous therapy stopped. Rehfuss tube removed.
31/12/42	46%	6·8	550	Icteric index, 18.		
4/1/43	45%	6·5	550	Icteric index, 11.		Condition good.

50%, and at 5 p.m. it was 55%; one litre of serum was given. On September 25, at 9.30 a.m., the hæmatocrit reading was 48% and at 8 p.m. it was 47%. The patient commented upon the difference in his subjective sensations after receiving serum. He stated that his mouth felt moist and that he was free from a severe thirst, which in spite of free fluid administration had affected him since his admission to hospital. The burnt areas subsequently healed rapidly, and there was a normal, quick convalescence.

This case demonstrates the beneficial effect of serum in allaying symptoms, and illustrates the occurrence of hæmoconcentration consequent upon pure plasma loss. (Compare the condition of hæmoconcentration which was illustrated in Case I.)

CASE IV.—The patient was a male, aged twenty-nine years, who had been burnt at 5 p.m. on February 17, 1943, in a flash explosion of some dynamite when he was lighting a gunpowder trail; he had sustained second and third degree burns of the face, ears, neck, arms, hands and legs, in the areas exposed by the wearing of only shirt, shorts and socks. For emergency treatment at the scene of the accident (120 miles from hospital), from a resuscitation team sent to him, he had received 600 cubic centimetres of normal saline solution with 5% glucose and three litres of serum. His progress is shown in Tables III and IV.

The laboratory findings of February 20, 1943, show rapid adjustment of the hæmatocrit value to normal after the cessation of intravenous therapy. The severe infection was apparently established as a result of the low blood sulphanilamide level, and the patient was quickly restored by attention to this and correction of the severe anæmia which had developed.

CASE V.—Case V illustrates the treatment of crushing injuries. A male patient, aged thirty-five years, rolled between the platform and a moving train, and sustained a grossly comminuted fracture of the left femur with severe bruising of the left flank and thigh, a deep lacerated wound of the left buttock and a compound fracture of the sacrum. On his admission to hospital at 7.30 p.m. on April 29, 1943, he was in a state of severe shock, with a barely perceptible pulse whose rate was 100 per minute; the systolic blood pressure was 80 millimetres of mercury and the diastolic pressure 55. As indicated below, after the administration of one litre of serum the systolic blood pressure rose to 105 millimetres of mercury and the diastolic pressure to 75; the pulse rate was 120 per minute and the pulse was of better volume. His progress was as shown in Table V.

The marked fall in blood pressure at 12.45 a.m. on April 30 we consider to have been accentuated by the use of blood instead of serum as the restorative fluid. It is a common experience to find that serum maintains the blood pressure much better than blood in such cases. The reason for this is discussed in the text. The laboratory findings from May 1 to May 6 illustrate the need for continued observation of such patients. The phenomenon of progressive fall in hæmoglobin value some time after injury is described by some observers as being due to blood loss into bruised tissues; but the natural equilibratory mechanism of hæmodilution must also be taken into account, as indicated by Sharpey-Schafer (1941).

CASE VI.—Case VI was one of old acute hæmorrhage. A male patient, aged twenty-five years, on January 6, 1943, sustained a bullet wound of the left thigh, which severed the femoral artery in Hunter's canal. Laboratory findings were as follows. He was admitted to hospital on January 10. On that date the hæmatocrit reading was 21%, the plasma protein content was 6·1 grammes per 100 cubic centimetres and the plasma chloride content was 570 milligrammes per 100 cubic centimetres. During the next four days, eight pints of blood were given. At the conclusion of the transfusion, on January 14, the hæmatocrit reading was 40%, the plasma protein content was 6·7 grammes per 100 cubic centimetres and the plasma chloride content was 590 milligrammes per 100 cubic centimetres.

This case illustrates the drop in plasma protein value as a result of adjustment following an acute hæmorrhage, and also the response to blood transfusion. Although both hæmatocrit reading and plasma values were practically normal on January 14 at the conclusion of the blood transfusion, the rise in the former was much greater than that in the latter.

CASE VII.—A male patient, aged twenty-nine years, was admitted to hospital in diabetic precoma; his blood sugar level was 1,100 milligrammes per 100 cubic centimetres. On the day of his admission to hospital the hæmatocrit reading was 57%, the plasma protein content was 6·8 grammes per 100 cubic centimetres and the plasma chloride content was 590 milligrammes per 100 cubic centimetres. During the ensuing twenty-four hours one litre of serum was administered, in addition to glucose, insulin and saline solution given intravenously. The next day the hæmatocrit reading was 46%, the plasma protein content was 5·9 grammes per 100 cubic centimetres and the plasma chloride content was 620 milligrammes per 100 cubic centimetres. The patient's condition was much improved.

The laboratory findings indicate that a condition of hæmoconcentration due to plasma loss with or without simple dehydration was present when the patient was admitted to hospital. This is evidenced by the normal plasma protein and chloride values associated with a high hæmatocrit reading. The reason for the administration of the serum is that it was

TABLE III.

Date.	Time.	Hæmatocrit Reading.	Plasma Protein. (Grammes per 100 Cubic Centimetres.)	Plasma Chlorides. (Milligrammes per 100 Cubic Centimetres.)	Intravenous Therapy.	Remarks.
On admission to hospital, 18/2/43	6 p.m. ..	47%	6·2	—	Serum continued.	Condition fairly good. Saline bath, sulphanilamide powder and *tulle gras* routine treatment carried out.
19/2/43	12.30 a.m. ..	46%	6·6	590	6 litres serum.	General condition remained good.
	6.45 a.m. ..	49%	6·8	590		
	5.15 p.m. ..	43%	7·1	590		
	11.45 p.m. ..	42%	6·9	580	Serum ceased.	
20/2/43	2.20 p.m. ..	44%	7·3	570		Condition satisfactory.

TABLE IV.

Date.	Intravenous Therapy.	Other Observations.	Remarks.
22/2/43		Less than 5 milligrammes sulphanilamide per 100 cubic centimetres of blood.	Condition satisfactory. Sulphathiazole, 1·0 gramme every six hours, now given in addition to sulphanilamide dusting until February 25.
24/2/43		Albuminuria.	Condition deteriorating.
25/2/43		Hæmoglobin value, 8·7 grammes *per centum*. Erythrocytes, 3,000,000 per cubic millimetre; leucocytes, 26,000 per cubic millimetre. Blood sulphathiazole concentration, 8·5 milligrammes per 100 cubic centimetres.	Delirious and toxæmic. Looked as if he might die.
26/2/43	1,200 cubic centimetres blood.		Considerable improvement after transfusion.
2/3/43	800 cubic centimetres blood. 1 litre serum.	Hæmoglobin value, 11·5 grammes *per centum*. Erythrocytes, 3,700,000 per cubic millimetre; leucocytes, 13,000 per cubic millimetre. Blood sulphathiazole concentration, 6·3 milligrammes per 100 cubic centimetres.	Condition good. Subsequent recovery rapid and uneventful. Burnt areas covered over rapidly and all joint movements fully preserved.

TABLE V.

Date.	Time.	Blood Pressure. (Millimetres of Mercury.)		Hæmatocrit Reading.	Plasma Proteins. (Grammes per 100 Cubic Centimetres.)	Plasma Chlorides. (Milligrammes per 100 Cubic Centimetres.)	Intravenous Therapy.	Remarks.
		Systolic.	Diastolic.					
29/4/43	8.45 p.m. ..	75	35	43%	7·1	660	1 litre serum.	Condition fairly good after serum.
	11 p.m. ..	110	70				400 cubic centimetres blood.	
30/4/43	12.45 a.m. ..	80	40	36%	7·1	650		Patient had just been turned over in bed to have pressure pad applied to sacral wound.
	2.45 a.m. ..	130	70				500 cubic centimetres blood.	
	4 a.m. ..	140	90	37%	7·0	630		Condition improved.
	8.45 a.m. ..	140	90	39%	6·9	590	800 cubic centimetres blood.	Improvement maintained.
	11 a.m. ..							Sacral and gluteal wounds explored and *débridement* carried out. Thomas splint and Kirschner wire extension applied. Cyclopropane and oxygen anæsthesia.
	2.45 p.m. ..			40%	7·2	590		Condition good, but abdominal distention present.
	5 p.m. ..							Exploratory laparotomy with negative results.
	7.40 p.m. ..			41%	7·2	590		Condition good.
1/5/43	12.30 p.m. ..			34%	6·8	570		Condition maintained.
3/5/43	12.30 p.m.			28%	6·9			During the whole of this period patient was bright and happy and said he felt very well indeed.
6/5/43	9 p.m. ..			25%	6·4	590		
10/5/43							2 pints blood.	Hæmoglobin value before transfusion, 9·2 grammes per 100 cubic centimetres of blood.

considered that unless some replacement of plasma protein were made, this value would fall unduly low during the restoration to normal of the hæmatocrit reading by the use of glucose and saline solution.

CASE VIII.—Case VIII was one of heat exhaustion. The patient, a male, aged thirty-four years, had been suffering from muscle cramps and vague abdominal pain accompanied by vomiting for one week, which followed upon a long march during a heat wave. On his admission, the patient was in a state of mild collapse, but he had a normal temperature (98·4° F.) with a pulse rate of 100 per minute, and the respirations numbered 24 per minute. On the day of his admission to hospital the hæmatocrit reading was 58%, the plasma protein content was 8·4 grammes per 100 cubic centimetres, the plasma chloride content was 370 milligrammes per 100 cubic centimetres and the hæmoglobin value was 19·2 grammes per 100 cubic centimetres.

During the ensuing three days he received by mouth six litres of fluid (including three litres of normal saline solution) per day. No intravenous therapy was employed. Improvement in the patient's condition was quite rapid after the institution of treatment. The vomiting ceased almost immediately. Two days later the hæmatocrit reading was 46%, the plasma protein content was 6·0 grammes per 100 cubic centimetres and the plasma chloride content 540 milligrammes per 100 cubic centimetres, and the patient appeared normal.

The laboratory findings on the first occasion indicate the presence of plasma loss as well as dehydration, as evidenced by the disparity in the percentages of increase of the hæmatocrit reading (33% above normal) and the plasma protein value (approximately 16% above mean normal value). This case is of particular interest in demonstrating the adjustment to treatment which occurs in suitable cases without the use of intravenous infusions.

Discussion.

As a result of the laboratory findings and our experience in the maintenance of favourable response to treatment in these and many other cases of similar type, it is our opinion that the relative importance of the various investigations, both clinical and laboratory, to be taken into account in the consideration of an individual case, is somewhat as follows.

Clinical History.

When available, the clinical history renders particular help in the assessment of the importance of neurogenic and other relevant factors. It has a special importance in indicating the majority of those instances in which the early institution of intravenous therapy is imperative, if life is to be saved.

Clinical Examination.

The importance of clinical examination in the confirmation of the clinical history is self-evident. Particular attention should be paid to the assessment of the degree of hæmorrhage into traumatized tissues—for example, the thigh and flank in Case V, as quite considerable amounts of blood may be lost in this fashion. Another important consideration is the necessity for a "repeat" examination after restorative treatment, as it has been our experience that the diagnosis of intraabdominal hæmorrhage may rest entirely on the local signs, such as shifting dulness and peritoneal irritation, in those cases in which the loss of blood volume has been fully compensated by serum therapy. To this may be added as a further aid to the diagnosis of concealed hæmorrhage the indirect evidence of delay in establishing full blood volume and a satisfactory blood pressure and the necessity for a faster flow of serum than usual to maintain equilibrium. We are inclined to agree with the observations of Giblin that inadequacy of response to serum therapy at the end of one and a half hours is due either to concealed hæmorrhage or to multiple perforations.

As it has now been generally accepted that restoration of blood volume with serum is necessary in all cases in which the systolic pressure remains below 100 millimetres of mercury after an initial period of observation, it has become of increasing importance to recognize these patients suffering from traumatic shock from whom a falsely high blood pressure reading may be obtained. Apart from cases of head injury, in which a disturbance of the hypothalamic centres may occur, there are, according to Grant and Reeve, two types of such cases, namely: (i) hypertensive subjects, to whom an injury occurs; (ii) young subjects, in whom a rise of pressure seems to be a reaction to injury, even when they have previously been normal. In this instance, though the brachial blood pressure is high, the radial pulse is often small and inconsistent with the blood pressure findings. This observation, taken in conjunction with the pallor and other circumstances, should cause one to remain on guard in such instances. Similar cases are also quoted by Kekwick and others.

We should like, however, in common with many others, to stress here that in assessing the gravity of the condition in cases of trauma the emphasis should be placed on the severity of the injury and on the amount of blood lost rather than on the blood pressure findings. In all cases of severe injury transfusion must be instituted early, and in such cases, serum should be used in preference to whole blood, as it has undoubtedly a greater value in the restoration and maintenance of the severely injured subject. This is apparently due to the fact that serum contains, volume for volume, a greater percentage of colloids and electrolytes than does whole blood, thus having approximately twice the osmotic pressure effect available to the latter, as the red cell

volume is valueless in this respect. In this connexion, the rate of administration of serum or blood is important in effecting the desired rate of blood pressure rise. In the cases with which we have so far had experience, we have found that a steady rise is usually obtained, without the need for positive pressure in the transfusion bottle, if a wide-bore needle with the bevel turned downwards after insertion is used in a vein in the antecubital fossa.

Biochemical Observations.

The biochemical observations dealt with chiefly comprise the following: (*a*) hæmatocrit reading or hæmoglobin value (these are usually roughly in agreement); (*b*) plasma protein estimation; (c) plasma chloride estimation.

The chart suggested by Kretchmar is a useful guide to the explanation of the relationships between the hæmatocrit reading and the plasma protein content. However, frequent repeated observations were considered necessary to compensate for the lack of blood volume measurements and for the absence of any estimate of tissue reserves of fluid, colloids and electrolytes. The chloride estimation was occasionally found of value, both as a check on the extracellular water balance, and in cases in which an excessive electrolyte loss had occurred (gastric and biliary fistulæ and heat exhaustion). In the interpretation of biochemical findings, it should be borne in mind that in general the hæmatocrit reading and plasma protein estimation, when used in clinical medicine, occupy a position of similar importance to that which has long been held by such estimations as that of the hæmoglobin value or of the blood sugar level. In the period immediately following an acute catastrophe, an extremely cautious interpretation should be made of estimations which are carried out before full hæmo-dilution and other physiological compensations may be presumed to have taken place. In the less acute type of case, the changes in biochemical findings often precede such clinical phenomena as a secondary blood pressure fall with sudden pronounced deterioration in the patient's condition due to the effects of deficiency of blood volume. On the other hand, in some of the cases here presented, clinical improvement following the institution of intravenous therapy often preceded and was totally disproportionate to the slight improvement in the biochemical values. Finally, in the chronic case, especially when prolonged intravenous therapy has been used, the hæmatocrit reading and plasma protein estimation have proved of particular value in making possible an assessment of the type of intravenous therapy to be employed. In most cases the response to attempted restoration by intravenous therapy, or the trend found at repeated estimations during a further period of observation without the use of intravenous therapy, will reveal in retrospect what was the most probable explanation of the initial clinical condition, as well as indicate the continued necessity or otherwise for restorative measures such as serum transfusion. It will follow from this that the clinical experience of the observer still remains of extreme importance. It will largely determine what departure from the normal frequency distribution range of biochemical values is allowable with safety in each case. It will also permit assessment of the degree of acuteness or chronicity, mildness or severity, of the conditions producing the abnormal biochemical findings in any given instance. It will finally influence the interpretation of values which appear normal, but in which complicating morbid processes of opposite type are occurring, such as dehydration in a case of hæmorrhage, or plasma loss in a long-standing case of anæmia. Finally, it should permit assessment of the importance of complications, such as dysphagia, nausea, vomiting and the like, which may preclude the restoration of biochemical deficiencies by such measures as a diet rich in protein, the forced intake of fluids by mouth and oral iron therapy. Naturally, as experience increases and physiological mechanisms are better understood, the need for biochemical investigations in the assessment and control in the individual case becomes less and less.

Conclusions.

The hæmatocrit and plasma protein findings have been presented in a number of widely varying conditions. It appears that these two observations, especially when considered together, are an extremely useful guide in the regulation of intravenous therapy and in indicating the type of fluid required, particularly in the less acute type of surgical case. They are of help also in the interpretation of medical catastrophes. On the other hand, it is clear that even when these values are within normal limits, in the absence of other investigations such as those of blood volume, tissue protein content, and electrolyte and fluid reserves, the interpretation must be made with extreme caution, and help is required from clinical observations. This is especially so in the acute case.

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BIOCHEMICAL ASPECTS OF SHOCK THERAPY.

By H. H. KRETCHMAR,

Lieutenant, Australian Army Medical Corps, Australia.

WHILST I was performing biochemical investigations at an Australian general hospital recently, the opportunity arose for the study of the biochemical aspects of intravenous therapy. At the outset it seemed that three phases of this subject merited particular study and attention: (i) suitable methods, which would enable a quick and accurate interpretation of the plasma-protein-hæmatocrit patterns to be made; (ii) arrangement of the analytical procedure in such a manner as to make available the results of the investigations in the shortest possible time; (iii) development of simple methods, which would be reasonably accurate, and which could be adapted for field use. As a result of the investigation, the chart (Figure I) presented later in the paper was drawn up to facilitate the interpretation of the plasma-protein-hæmatocrit patterns. It is thought that this chart covers most of the conditions likely to be encountered in practice. Admittedly, some of the conditions are not likely to be met with very frequently in military hospitals; but it seemed preferable to make the chart of general application rather than to limit it to conditions likely to be encountered in military hospitals. Further, some of the more rare conditions may have been disregarded—for example, polycythæmia—but it is considered that data supplied should be adequate to ensure an interpretation of these few rare cases.

It was found possible to arrange the experimental routine so that the results of the three determinations usually required could be made available in about half an hour. This routine is described in the paper.

Finally, methods have been suggested for use in the field. With regard to the method described for the plasma protein determination, it was found that, from the examination of comparatively few samples, values obtained by the procedure agreed fairly well with values obtained by the

falling-drop method. Unfortunately, before a series of samples could be examined by this method and by a standard procedure, my attention was claimed by work of a more urgent nature. Nevertheless, the preliminary investigations appear to warrant a description of the method, in order that those who are interested, and in a position to do so, may check the method against a standard procedure.

Methods.

When such a procedure is possible, blood—about eight cubic centimetres—is drawn from the vein in the cubital fossa with a perfectly dry, clean syringe. When such a procedure is not possible because of unsatisfactory veins or injuries to the arms, it is drawn from the next most convenient place.

From seven to eight cubic centimetres of the blood are added to a perfectly dry, clean hæmatocrit tube having a capacity of about 8·5 cubic centimetres, to which has previously been added approximately one milligramme of heparin. The tube is closed with a rubber stopper and gently inverted several times to distribute the anticoagulant through the blood. It is necessary to have tubes of about the capacity mentioned in order that sufficient plasma for the protein and chloride determinations will always be available. Also, sufficient plasma is usually available to make such a determination as an icteric index, if indicated.

The hæmatocrit tube is next balanced and the cells are spun down in the usual manner. Such a machine speed as will give a constant cell volume after spinning for twenty minutes is suitable. The level of the red cell layer is noted, and also the level of the bottom of the meniscus of the supernatant plasma. One hundred times the former volume divided by the latter volume is the hæmatocrit value—that is, the percentage of red cells in the blood sample.

The protein content of the plasma has been determined by the falling-drop method of Barbour and Hamilton (described in Scudder's book "Shock: Blood Studies as a Guide to Therapy"), and the chloride content of the plasma by the standard Whitehorn procedure. The reports in the literature show close agreement between values obtained by the falling-drop method and values obtained by other methods. The falling-drop method has the great advantages of rapidity, simplicity and economy of materials.

In practice, it has been found that all the above-mentioned determinations—namely, hæmatocrit reading, plasma protein and plasma chloride content, and icteric index—may be required during the course of therapy. The main three of these determinations can be completed in about half an hour. To do this it is necessary to proceed as follows:

1. Commence the spinning of the hæmatocrit tube.
2. Perform the falling-drop experiment with the standard potassium sulphate solution.
3. Stop the centrifuge, read and note the total volume, and fill the plasma protein pipette with the cell-free plasma which has formed at the top of the hæmatocrit tube.
4. Replace the hæmatocrit tube in the centrifuge and start the machine again.
5. Perform the falling-drop experiment with the plasma to be examined.
6. From the second and fifth observations calculate the plasma specific gravity and hence the protein content of the plasma.
7. When sufficient time has elapsed, stop the centrifuge, read the red cell volume, and with the blood volume found in the third step calculate the hæmatocrit reading.
8. It may be possible to obtain sufficient plasma at the completion of the third step to start the chloride determination, but if not, commence it at this stage. Filtration of the protein precipitate in this determination is hastened by the use of Whatman Number 4 filter papers.

Field Methods.

The hæmatocrit determination and the plasma protein determination as mentioned above have proved ideal for use in the laboratory. However, for use in the field other methods are necessary. A high-speed centrifuge may not be available for the hæmatocrit determination, and the falling-drop apparatus is not easily transported from place to place.

In lieu of the hæmatocrit reading, the hæmoglobin percentage may be determined. It is advisable to determine the hæmoglobin percentage of venous blood and not of capillary blood, because, owing to the capillary stagnation which takes place during shock, the red cell percentage of capillary blood may be much higher than that of venous blood. Discrepancies as great as two million red blood cells per cubic centimetre have been reported in the literature, and most of our knowledge of intravenous therapy is based upon the findings for venous blood.

I have considered the possibility of evolving a method for making plasma or serum protein determinations in the field, and believe that the method to be described will prove satisfactory. Only a small volume of plasma is required for this method, so that a sample of blood need only be centrifuged in a hand machine for a short time to obtain the necessary material. In the absence of a centrifuge, serum may be used; but it must be remembered that the fibrin, about 0·3% protein, will be lost in the coagulum. The main disadvantage of using serum is that one must wait for the blood to clot; this process, however, can be accelerated to an appreciable extent by keeping the blood warm.

Of the various methods which are used for the estimation of protein content, it would seem that a turbidimetric method is best adapted to use in the field, so the possibility of adapting such a method for the purpose in view was investigated. The turbidimetric method is used for the routine estimation of protein in cerebro-spinal fluid. Various protein precipitants are used, including trichloracetic acid, sulphosalicylic acid and Exton's reagent (sodium sulphate and sulphosalicylic acid). Of these reagents I have come to prefer Exton's for the routine examination of cerebro-spinal fluid, and it appears to be equally suitable for the examination of plasma.

For the accurate determination of protein content by the turbidimetric method, the following factors must be considered: (i) The density of the suspension of protein precipitate must be suitable for comparison with the standards when the size of the comparison tubes has been decided. (ii) The degree of turbidity of the solution must not change during the period of observation—for example, by the settling or agglomeration of the particles. (iii) The standards must maintain their original values indefinitely.

Since Exton's method for the determination of protein in cerebro-spinal fluid has been found satisfactory, we can assume that standards made up in the same manner will prove satisfactory for the determination of protein in plasma. Settling and agglomeration of the particles in the standards for Exton's method are delayed by the use of gum arabic, and the same material may be conveniently added to the plasma to be examined by being incorporated in the dilution fluid.

Several factors must be taken into consideration when the size of the comparison tubes and the dilution of the plasma to be used are being chosen. These include the availability of suitable measuring apparatus for diluting plasma, the use of tubes of such a size as will give sufficient depth of material for comparison purposes, and the use of tubes which will give the best degree of opacity when filled with the suspensions to be compared. By trial and error it was found that good results could be obtained by diluting the plasma one hundred times and using tubes of internal diameter near 0·43 inch.

I found the best quality test tubes to be American "Pyrex" test tubes made by the Corning Glass Works, Number 9820, without rim, size 13 by 100 millimetres. The majority I tested were found to have no constriction at the top, formed during manufacture, to have strong walls which were uniformly thick all round, and to have a maximum difference between the greatest and least internal diameter at the top (as measured by an internal screw micrometer) of 0·005 inch. The maximum and minimum diameters found in the testing of 48 of these tubes were 0·410 and 0·436 inch respectively. Two sets each of fifteen

of these tubes were selected. This allowed for ten tubes for the standard suspensions and five comparison tubes in each set. The internal diameters of one set varied from 0·424 to 0·432 inch, and of the other from 0·434 to 0·443 inch. If many tubes were examined with a view to making up a considerable number of sets, sets of fifteen tubes having even less variation in diameter than this could be selected and all the tubes used. However, just to consider, for example, the first set, the percentage variation between the smallest and the largest dimension of the tubes calculated on the mean dimension is 1·9, and the percentage variation between the mean and extreme dimensions 1·2.

The range of protein values likely to be found in practice is about 4·5% to 9·0%. Hence, if the plasma is diluted one hundred times, the range of concentrations will be 45 to 90 milligrammes *per centum*. This dilution may be accomplished by adding 20 cubic millimetres of plasma, measured with an ordinary hæmoglobin pipette, to two cubic centimetres of diluting fluid measured with a pipette. The error of using two cubic centimetres of diluting fluid instead of 1·98 cubic centimetres—that is, 1%—is less than the attainable accuracy of the method. It is necessary to standardize the pipettes, as these may have considerable errors in volume. When two cubic centimetres of precipitating reagent are added to the diluted plasma to give four cubic centimetres in all, the resulting volume of fluid is suitable for use in the above-mentioned test tubes. A suitable diluting fluid is made by adding 1% sodium chloride together with 0·5% gum arabic to distilled water and filtering if necessary.

Assume that we aim at determining the protein content with an accuracy to within 0·25%. Then the minimum difference in protein concentration between any two standard tubes will be 9·0—8·75/8·875—that is, 2·8%. If we assume that for small differences in concentration the difference in turbidity of the solutions will be proportional to the difference in protein concentration, it is obvious that the variation in the diameter of the tubes, discussed earlier, is of no significance, particularly if the tubes around the middle of the range, when the tubes are arranged in order of size, are selected for the comparison tubes and the rest are used for standards.

A suitable set of standards consists of ten tubes containing solution with 4·5, 5·0, 5·5, 6·0, 6·5, 7·0, 7·5, 8·0, 8·5 and 9·0 milligrammes *per centum* of protein suitably treated to precipitate the protein. The standards are prepared as follows:

The protein content of a sample of plasma is determined by one of the standard methods, and from this a solution containing 0·2% of protein is prepared by diluting the plasma with 2·0% sodium chloride solution. To each of ten test tubes (sizes six inches by three-quarters of an inch) are added ten cubic centimetres of clear 1% gum arabic solution. To the first tube are added 4·5 cubic centimetres of the 0·2% protein solution, to the second 5·0 cubic centimetres, and so on, the last tube receiving 9·0 cubic centimetres. Then, to the first tube of the series are added 5·5 cubic centimetres of the 2·0% sodium chloride solution, to the second 5·0 cubic centimetres, and so on, the last tube receiving 1·0 cubic centimetre. The tubes are stoppered and the contents well mixed by gently inverting the tubes a number of times. Vigorous shaking should be avoided, as it causes troublesome frothing. The solutions are used for filling the standard tubes, three cubic centimetres of the requisite solution being added to each tube. Finally, three cubic centimetres of Exton's reagent are added to each tube and the tubes are sealed. Rubber stoppers were used for sealing the experimental sets which I made up, but obviously better sealing is desirable. After being sealed, the tubes are gently inverted a number of times in order to mix the contents. Again, vigorous shaking is to be avoided, as it causes troublesome frothing.

Exton's reagent is made as follows:

Dissolve 50 grammes of sulphosalicylic acid (salicylsulphonic acid) and 10 grammes of sodium sulphate (crystals) in about 800 cubic centimetres of distilled water. Add 25 cubic centimetres of a 0·4% aqueous solution of bromphenol blue. Transfer to a measuring flask of one litre capacity and make up to volume. Filter if necessary.

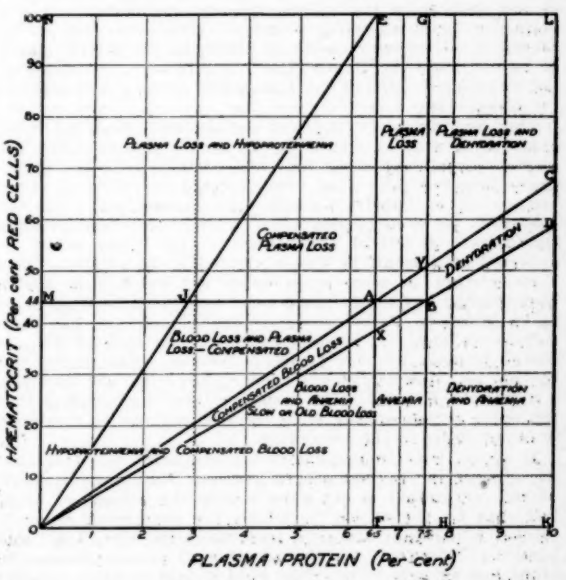
Comparison of the samples with the standards is facilitated and closer matching made possible by the following very simple device. A piece of glass is finely ground on both sides, and on one side a series of parallel lines is ruled fairly closely together. The lines should be graded from a very fine line to a line about one-sixteenth of an inch wide. To make the comparison the tubes are held side by side against the ground glass plate, the side of the plate on which the lines are ruled facing the operator. The tubes should be viewed with a good even light in front of the ground glass, and with a minimum of side light falling on them. Side light may be shielded from the tubes with the hands. It would be an improvement to fit the glass to a wooden frame of shallow depth, which would both screen side light from the tubes and be a protection to the glass. In an emergency a piece of stiff white paper or card with a series of lines ruled on it, as described in the case of the glass, may be used instead of the ground glass.

It is easy to match the tubes, a comparison to within 0·5% being readily achieved, and, with practice and good lighting conditions, to within 0·25%.

The Whitehorn procedure for plasma chloride determinations is satisfactory for field use, for if a regular pattern pipette of two cubic centimetre capacity graduated in hundredths of a cubic centimetre is used for the final titration, all the measurements can be made with pipettes.

The Interpretation of the Chemical Analysis.

The problem of the interpretation of the chemical analysis may be best studied by a consideration of the changes which will take place in the composition of the blood as a result of the loss of: (i) water (and electrolytes), (ii) plasma, (iii) whole blood. In the chart (Figure I) hæmatocrit values are plotted along the vertical axis and plasma protein values along the horizontal axis.



The work to date indicates that the normal hæmatocrit value of the males with whom we come into contact is 44 and the protein concentration of the plasma is between 6·5% and 7·5%. The point *A* on the chart corresponds with a hæmatocrit value of 44 and plasma protein value of 6·5%, and the point *B* with the corresponding values of 44 and 7·5%. Thus, blood having composition corresponding with any point on the line *AB* may be regarded as of normal composition. Let vertical straight lines *EAF* and *GBH* be drawn through the points *A* and *B* respectively, and let straight lines *EO*, *CAO* and *DBO* be drawn to pass through the origin and the points *E*, *A* and *B* respectively.

For the time being, let us disregard the complications which will be introduced by consideration of the spleen's

acting as a reservoir of blood or red cells, by the loss of red cells from the circulation due to capillary stagnation following upon fluid loss, and by the transference of protein to and from the body reservoirs of this material.

If water (and salts) is lost from the circulatory system, both protein and cells will be concentrated to the same degree. If the blood initially is of composition corresponding with the point *A*, as dehydration progresses the composition will change in such a way that the composition will correspond in turn with points along the line *AC*; the greater the degree of dehydration, the closer the point denoting composition will be to *C*. Similarly, if the blood initially is of composition corresponding with the point *B*, as dehydration progresses the composition of the blood will be indicated by a series of points along the line *BD*. In general, if blood is found to have a composition corresponding with a point in the area *ABDC*, the inference is that dehydration has taken place.

Let us consider next the changes in the composition of blood resultant upon hæmorrhage. If no fluid entered the circulatory system to replace the blood lost, the composition of the blood remaining in the circulatory system would remain unchanged. On the other hand, if the blood lost was replaced partially or completely with water (and salts), then both the remaining cells and plasma protein would be diluted to the same extent. If we reason as in the case of water loss, if blood is found to have a composition corresponding with a point in the area *AOB*, the inference is that hæmorrhage has taken place and that the volume of blood lost has been to some extent replaced by water.

It is generally considered that the spleen acts as a reservoir of red cells. If the spleen does behave in this manner, in the initial stages of hæmorrhage the intake of water from the digestive tract together with the liberation of red cells from the spleen will obscure blood loss. If, instead of being merely a reservoir of red cells, the spleen serves as a reservoir of whole blood, in the initial stages of hæmorrhage the liberation of this blood in response to the underfilled state of the circulatory system will obscure the blood loss.

The healthy body appears to be well supplied with reserves of protein. In cases in which compensation for loss of circulating fluid leads to protein dilution, unless the protein reserves have been depleted by recent calls for protein, it is slowly brought into circulation from the reserves. As a consequence, in cases of slow hæmorrhage the protein deficit of the plasma is less than would be expected as a result of uncomplicated blood dilution. The same picture is seen when cases are studied in which hæmorrhage has taken place some considerable time prior to examination. Obviously, if the hæmorrhage has been sufficiently slow, or if sufficient time has elapsed since a severe hæmorrhage for complete protein replacement, but the red cell volume has not been replaced, we are left with a picture of anæmia. The result of these processes is that the point corresponding with the composition of the blood is found to lie in the area *BOH*.

It seems wise to emphasize at this point the fact that the change in the hæmatocrit reading (hæmoglobin value or red cell count) is not governed by the volume of blood lost, but by the extent to which the remaining blood is diluted with water absorbed from the alimentary tract and tissues. Therefore, for the purpose of proving suspected blood loss as soon as possible, fluid should be given rapidly by mouth to preclude misleading hæmatocrit values.

It should also be emphasized that a given rate of change in hæmatocrit value (red cell count or hæmoglobin percentage) indicates a far greater rate of loss of fluid when the initial value is low than when it is high.

The area *ABHF* covers the composition of blood samples which have normal plasma protein concentration, but are lacking in red cells—that is, it is the area of the anæmias.

Consider next the result of plasma loss. If there is no compensation for plasma loss by intake of water, the protein content of the plasma remaining in circulation will be unchanged, but the red cell percentage of the blood will increase. Thus, if we have a case in which the blood composition initially corresponds with the point *A*, as plasma loss takes place the composition of the blood will correspond progressively with a series of points along the line *AE*. Similarly, if we start with blood having the composition corresponding with the point *B*, as plasma loss takes place the composition of the blood will correspond progressively with a series of points along the line *BG*. In general, if blood is found to be of composition corresponding with any point in the area *AEGB*, the inference is that plasma loss has taken place.

The effect of water compensation for plasma loss may be shown as follows. Suppose we start with normal blood having the composition corresponding with the point *A*. Let plasma loss proceed until the composition is given by the point *E*. As water compensation proceeds, both red cells and plasma protein will be diluted to the same extent, and the composition of the blood will progressively correspond with a series of points along a straight line joining *E* with the origin *O*. Thus, if blood has a composition corresponding with a point in the area *AEJ*, the inference should be that plasma loss (hæmoconcentration) has occurred, together with some degree of water replacement.

A more complicated case than those preceding is that in which hæmorrhage and plasma loss occur simultaneously. Let us consider the changes step by step, taking first the case in which there is no water compensation.

The result of blood loss without compensation is that the circulatory system is left underfilled, but the composition of the remaining blood is the same as before the loss took place. If after the blood loss a loss of plasma occurs, the composition of the remaining plasma will be unaltered, but the red cell concentration of the blood will increase. Thus, the blood composition will be indicated by some point in the area *EABG*.

As in the case of pure plasma loss, water compensation causes a shift into the area *EJA*. When the volume of fluid lost has been completely replaced by water, the composition of the blood will correspond with some point in the area *AOJ*, for plasma protein concentration must be below normal and some volume of red cells has been replaced by water. Of course, slow loss of blood together with a plasma loss compensated by water intake at such a rate that hæmoconcentration does not occur, causes a change in composition to the same area *AOJ*.

It is readily seen that plasma loss following upon an initially dehydrated condition leads to a change in the blood composition such that the point denoting the blood composition falls in the area *GYCL*, for dehydration causes a shift to the area *CYBD* and subsequent plasma loss causes a shift in a vertical direction to the area *GYCL*.

The point denoting the blood composition of an anæmic person falls in the area *AFHB*, for the blood has a deficit of red cells, but in general the protein content of the plasma is normal. Let us visualize a straight line passing through the point denoting the composition of an anæmic person's blood and the origin *O* of the graph. If this person is subjected to some dehydrating process, the red cells of his blood and the plasma protein will be concentrated to the same degree. Therefore, the composition of the blood will change in such a way that the composition will correspond in turn with points along the line to the right of the original composition point; the greater the degree of dehydration, the further the point denoting composition will be to the right of the original point. Thus, the area *BHKD* covers the composition of samples from persons, initially anæmic, who have been subjected to some dehydrating process. If, instead of blood concentration due to water loss, we have blood dilution due to blood loss and the intake of water, the composition of the blood will correspond in turn with points along the same line, but to the left of the point denoting the original composition. Thus, the area *AOF* covers the composition of samples from persons, initially anæmic, who have lost blood, the blood loss being to some extent compensated by water intake.

Should the point denoting blood composition fall somewhere on the line *MA*, it is obvious that we have a case of hypoproteinæmia, because although the red cell concentration of the blood is normal, the protein content of the plasma is subnormal. By analogy with suitable cases among those mentioned earlier, it can readily be seen

that loss of plasma causes a shift to the area *MNEA* and blood dilution following upon blood loss causes a shift to the area *MAFO*.

It should now be obvious that, in some cases, the abnormal composition of a sample of blood may be due to one of several different factors.

Fortunately, for the purpose of controlling intravenous therapy it is not necessary to know which factors are responsible for the abnormal blood composition. We simply proceed to give such fluid as is required to cause a change in the desired direction and follow the changes during therapy by a series of blood examinations.

For example, if the point denoting blood composition lies somewhere in the area *NMBG*, serum should be given. The loss of one pint of plasma—that is, a 10% reduction in blood volume—causes a rise in the hæmatocrit value to approximately 50. Since reduced blood volume causes a whole series of undesirable phenomena, the secondary phenomena of shock, it appears desirable to aim at keeping the hæmatocrit value down to 50. It is impossible to calculate the volume of serum which will be required, for three reasons: (i) at the time when therapy should be commenced we are dealing with a dynamic phenomenon; (ii) owing to increase in viscosity of the blood and vaso-constriction, an indeterminable quantity of red cells will be immobilized in the capillaries; (iii) the blood volume is unknown. Various methods for determining blood volume have been described, but to me these appear to be inaccurate in cases of shock, because of the capillary stagnation just mentioned.

If the point denoting blood composition lies in the area *MOHB*, whole blood should be given until the hæmatocrit value becomes normal. If, at this stage, the plasma protein concentration is subnormal, serum may be given to increase the protein content. In this case also it is impossible to calculate the volume of fluid or fluids to be given, for the following reasons: (i) dynamic phenomena may or may not be involved; (ii) capillary stagnation may be present; (iii) the blood volume is unknown; (iv) an indeterminable quantity of the material transfused will pass into the body reservoirs.

The chart as shown here covers a range of values which is, of course, much wider than would ever be encountered in practice. It was necessary to present it in this form in order that the method of construction would be obvious. The area enclosed in the dotted-in rectangle should cover almost all cases likely to be met with in practice.

It seems wise, at this stage, to emphasize that the accuracy of the chart should not be criticized upon preconceived ideas of the changes taking place in any given condition. Consider, for example, the changes which may be found consequent upon severe burns; the statement is frequently made that the changes in the blood composition are due solely to the loss of plasma. If this were so, the plasma-protein-hæmatocrit pattern should fall in the area *EABG* (if we assume, for the sake of argument, that compensation is absent). However, in actual fact, the pattern may fall in the area *GYCL*, indicating a loss of fluid greater than can be accounted for by assuming a loss of pure plasma alone. If we allow that the chart has given a true indication, it may be possible to prove this, and in the case chosen for example, it may be done quite simply. In the first place, examination of the fluid in blisters, after it has been freed of remnants of tissue, shows that the protein content of this fluid is less than the protein content of the patient's blood plasma; and secondly, further confirmation is given by the fact that the loss of chloride (shown by blood analysis) necessitates the administration of an occasional litre of saline solution as well as blood plasma or serum during the period of treatment.

So far, no mention has been made of the use of the plasma chloride determination. As may be seen from the foregoing discussion, the hæmatocrit value and the plasma protein concentration provide the essential data for diagnosis of the clinical condition. The only value of the plasma chloride determination in this respect is that it provides confirmatory evidence in cases of heat exhaustion, for the dehydration is accompanied by pronounced chloride loss.

However, during therapy plasma chloride determinations are often essential. Many conditions associated with increased water loss from the body, such as intestinal fistulæ, which involve serious losses of chloride, will come to mind. Cases of burns should not be forgotten in this regard. In the case of severe burns, it is found that a certain amount of saline solution must be given during the period of intravenous therapy to prevent the plasma chloride concentration from becoming subnormal.

Acknowledgement.

My thanks are due to the Director-General of Medical Services, Major-General S. R. Burston, for permission to publish this paper.

Reference.

(1) H. N. Harkins: "Recent Advances in the Study and Management of Traumatic Shock", *Surgery*, Volume IX, 1941, page 231.

MESIAL LEG STRAIN.

By W. R. GROVES,
Honorary Surgeon, Kyneton District Hospital, Kyneton, Victoria.

With an Addendum by FAY MACLURE,
Melbourne.

UNDER the heading of mesial leg strain, I would draw attention to what I believe to be a frequent cause of leg troubles, which I have been unable to find described in the literature. Personal experience brought the subject to my notice—constant trouble with my knees over a period of some years. When I discovered the cause, mesial leg strain, its elimination entirely relieved me within three weeks, and for some years now I simply have not been conscious of having knees. This is the story.

One evening some six years ago, after a round of golf, I fell asleep in my easy chair with my legs crossed and extended. On awakening I became conscious of a distinct pain at the inner side of my right knee. I was surprised, as I had never felt anything like it before and had no recollection of having in any way injured or strained the knee. There was no swelling of the knee, only a localized spot of tenderness at the joint line. Many subsequent examinations satisfied me that the tender spot, which never varied in position, was situated immediately below rather than at the joint line, about the position of the internal lateral ligament.

For some time the pain remained a constant source of discomfort, sometimes causing me to limp. Then one day, on starting a round of golf and swinging for my drive off the first tee, I was seized with a sudden sharp pain in my "gammy" knee, which made me drop my club and grasp my knee with both hands. There was no locking of the joint, nor any more golf for a time.

The knee quickly swelled, and that night I shall not forget in a hurry. Anyone who has had acute synovitis will know what that first night is like. After a few days in bed and some three weeks on sticks, I got back to carrying on as usual, constantly reminded that there was something wrong with my right knee.

About this time an orthopædic surgeon kindly examined my knees and stated that he thought that the internal cartilage of my right knee was a little loose. He advised me to bandage the knee, at any rate when I played golf, which I did.

Some months later I was motoring to the seaside for my annual holiday. On the way I was astonished to feel for the first time a similar pain setting in at exactly the same spot on my left knee. From then on I had both knees troubling me, though that did not prevent me from playing golf. But I began to wonder if the day was not far distant when I should be debarred from doing so. Then one day I took part in a tournament on a hilly course, having for a partner a young and athletic professional who scaled the hills like a mountain goat. The morning round was quite a success, my partner incidentally "holing in one" at one hole. During the afternoon my left knee began to trouble me more and more, till I had to stop playing and content myself with scoring for my partner. I may be permitted to add that he won the professional purse

for which he was competing. There followed another attack of acute synovitis, a bad night, and three weeks of limping about with a stick.

After some months, worried by one or other of the knees, I was one night again at ease in my chair when the thought arose that constant strain on the inner sides of my knees from walking incorrectly might be the cause of it all. I then stood up with my toes turned out, as I had been taught to do when I was a boy—particularly, I remember, as a cadet. I at once appreciated that my body weight was borne on lines projected down the inner sides of my legs, and that if I straightened my feet the weight was at once transferred to the outer sides of the legs, all strain being taken off the inner sides of my knees. From that night, I tried to remember to walk with my feet directed nearly straight, and to encourage this, had the inner corners of my heels built up a quarter of an inch. The result was an absolute cure, as already stated, and I have since been able to relieve a number of patients similarly troubled.

To appreciate what I mean by mesial strain, let the reader stand with toes turned out and relax sufficiently to feel the body weight transmitted down the inner sides of the legs. Then turn the toes forward and the body weight is felt to be deflected to the outer sides of the legs and feet. Try it in front of a mirror and see if you do not look and feel a better specimen of genus *Homo* with your weight borne on the outer sides of your feet. Now repeat the exercise several times, gradually decreasing the angle of change in the position of the feet, and it will be appreciated how slight a change in the angle will disturb the balance of weight-bearing from one side to the other of the legs.

No doubt many people who walk with their toes turned out experience no ill-effect, especially the young and athletic; but after middle life, when muscle tone is apt to lessen and body weight to increase, this mesial leg strain may well become a source of trouble. In my case and in others, it has been the knee joint that has suffered. What about the ankle and hip? In the causation and treatment of flatfoot this strain must be taken into account, and it may well play a part in the incidence and aggravation of that cruel hip trouble, osteoarthritis.

> One man, elderly and heavy, consulted me about a pain in his right hip which had persisted for some time. His opposite leg was half an inch short as the result of an old fracture, and he walked with the right foot turned out to an exaggerated degree. When adjustments were made to his boots, and an explanation was given of how he should walk in order that his heavy weight should be borne down the outer side of the leg, he lost all his pain in the hip.

The position of maximum function is well appreciated when one is dealing with the hand. It is perhaps not too much to suggest that there is a position of maximum function for the feet and legs in walking, and that its importance should be recognized.

When our ancestors first adopted an upright posture, it seems reasonable to suppose that, having to support a body previously borne by four legs, the hind legs naturally assumed the position of maximum function. In such animals as the orang-outang one sees a massive body supported by inadequate-looking legs, much bowed, the feet being turned inwards and the body weight borne by their outer borders—an exaggeration of the position of maximum function of the legs and feet of man.

I was interested to learn from a member of the Field Naturalists' Club that in their long tramps he and others found that they walked best if they paced along with their feet almost straight and as nearly as possible in line ahead. This description of their footwork called to mind the word "instep", with the suggestion that the origin of this word might well bear some relationship with the orthostatic principle under consideration. However, I learn from the highest philological authorities that the problem of the origin of the word "instep" is insoluble.

The importance of correct footwork in the act of walking is, I believe, not sufficiently appreciated. If, during the physical training of school children and army recruits *et cetera*, it was taught that in walking the foot levers the body forward, and that during this leverage the weight of the body should be borne by the outer half of the foot, fewer ambulatory troubles would occur; including, I suspect from recent experience, discomfort due to callosities under the heel of the foot, and even some corns.

ADDENDUM.

(Fay Maclure.)

In his book "Orthopædic Surgery", at page 560, Whitman makes the following statement:

> Genuvalgum is an exaggeration of what is known as the attitude of rest or relaxation, in which the weight of the body is thrown in great part upon the ligaments of the three joints of the lower extremity. In the attitude of rest the pelvis is tilted forward, the femora are rotated inward upon the tibiæ, and the feet are separated and everted, so that the greatest strain falls upon the inner sides of the knees and of the feet.

Again, in discussing the architecture of the foot, he calls attention to the fact that "the outer arch (of the foot) is more solidly braced, and, therefore better adapted for continuous weight bearing than is the higher and more elastic inner arch". Whitman makes the following further statement:

> The custom of turning the feet outward embarrasses their leverage function (in the act of walking). Outward rotation of the limb is normal in the passive attitude because it enlarges the base of support and thus relieves the muscles. On this very account it is the improper attitude for activity because the strain falls upon the inner border of the foot, or to the inner side of the fulcrum, and makes the proper exercise of muscular power and alteration of posture impossible. In other words the attitude is normal when the foot is used as passive support and abnormal when it is in active use.

In corroboration of these statements it may be observed that the fleet of foot and the sound of limb are so frequently bandy-legged and pigeon-toed, and that the sufferer from torn semi-lunar cartilage of the knee joint is infrequently bow-legged in type.

When the subject of leg or foot injuries, whether fracture or sprain, again bears weight on his injured limb after a period of rest in bed, he usually adopts an attitude of out-turning of the foot and inward projection of the knee. Such a posture is often followed by pain in ankle or knee—the result of undue ligamentous strain. It is therefore necessary to instruct the patient that this attitude is harmful and that he should walk with his toes inturned, his knees braced and the weight carried on the outer sides of his feet.

TECHNIQUE OF INTRACAPSULAR EXTRACTION OF CATARACT.[1]

By E. V. WADDY POCKLEY, M.B., B.S. (Sydney), D.O. (Oxon.), D.O.M.S. (England), F.R.A.C.S. (Ophthalmology),
Sydney.

THE surgical technique I am about to describe has been evolved in collaboration with Dr. Colin Ross, at the Royal Prince Alfred Hospital, Sydney. It is the result of our joint experience and endeavour since we began during 1942 to practise intracapsular extraction as a routine measure. We introduced no new operative manipulations. Instead, we have adopted selected procedures already tried and proved by various well-known protagonists of total extraction abroad, and developed what we believe to be a simple, safe and generally satisfactory technique with a wide field of application in cataract surgery.

The practice of intracapsular extraction is by no means a recent one. Over twenty years ago it had adherents; but the technique then used frequently resulted in disastrous complications, and brought the operation into disfavour with many. Modern improvements in technique have removed many of the earlier objections, and today it is regarded as the operation of choice by experienced surgeons in many parts of the world. Three main methods have been described: first, that of external pressure, developed by Smith in India; secondly, forceps extraction, with or without the aid of external pressure; and thirdly, vacuum cup extraction, as originally described by Barraquer.

The most generally accepted present-day technique seems to be one which combines external pressure with gentle rocking and traction with the forceps. This is the method we have adopted and which I propose to describe in some detail.

The greatest single objection to intracapsular operation has always been the possibility of vitreous loss. We have met with this in only one case, to which I shall refer later, and with the appropriate precautions (which I shall detail) we do not regard it as a hazard of sufficient magnitude to contraindicate the

[1] Based on a paper read at a meeting of the Ophthalmological Society of New South Wales on November 22, 1943.

adoption of this type of operative procedure. Objections were also raised on the assumption that damage was done to the ciliary body, which led to slow degenerative changes. Recent experimental work has proved conclusively that when the zonular fibres rupture they do so near their union with the lens, and that the ciliary body is unharmed.

The main advantages of total extraction are that the question of lens immaturity can be ignored, there is never any need for irrigation or subsequent needling of secondary cataract, and post-operative congestion due to cortical remnants does not occur.

The Technique.

The special details of our technique are as follows.

Pre-operative Measures.

1. Sedation with "Nembutal" or "Sodium Amytal" is employed.
2. The pupil is dilated as fully as possible.

Operative Procedure.

The local anæsthetic employed is "Decicain" (Bayer) ½% with adrenaline. This is preferred since it does not impair the transparency of the cornea (as cocaine sometimes does) and therefore allows of clearer observation of the forceps manipulations and the dislocation of the lens.

1. A sub-conjunctival injection of two minims of *Liquor Adrenalini* is given, in order to secure wider dilatation of the pupil (if this is not already adequate); this dilatation also persists after the opening of the anterior chamber.
2. The orbicularis muscle is paralysed by the O'Brien method.
3. A skin suture through the upper lid is inserted to effect post-operative closure.
4. A bridle suture is inserted through the superior rectus muscle to control movement of the eye.
5. If a speculum is used, it is removed as soon as the corneal section has been completed; but with a skilled assistant we have not found the use of a speculum essential. The upper lid is well retracted by the bridle suture, while the lower lid can be managed by the assistant's finger.
6. A full half section of the cornea is made with a small conjunctival flap above.
7. One, and sometimes two, fine silk sutures through the flap are inserted as soon as the corneal section is completed. They are carried on through the upper lip of the conjunctival wound, and the ends left ready for tying as soon as the lens is removed, with a small loop between the wound edges.
8. If the pupil is wide enough to allow of extraction without iridectomy, this is attempted. If it is found that iridectomy seems necessary, either to permit unhampered introduction of the forceps or to facilitate delivery of the lens, a complete iridectomy is performed.
9. The forceps are then introduced into the eye, the anterior lens capsule is grasped as near the lower pole as possible, and a fold is picked up. If the pupil has not become dilated as widely as is desired, the forceps are slid beneath the lower pupil margin in order to obtain this grip. Gentle lateral, vertical and antero-posterior movements are made in order to rupture the suspensory ligament below. At the same time pressure is made backwards at the limbus from four to eight o'clock with a strabismus hook. The external pressure puts the zonule on the stretch and undoubtedly assists the forceps traction in bringing about dislocation of the lens inferiorly. When this occurs, the inferior border usually comes slightly forwards and can be seen above the lower margin of the iris. The grip with the forceps is maintained and pressure is continued with the hook in a backward and upward direction. These combined manœuvres cause the lens to tumble or rotate on its horizontal axis, so that the lower pole comes forwards and upwards, and gradually it is brought up into, and finally through, the lips of the corneal wound. At this stage considerable gaping of the wound margins and buckling back of the cornea occur, but no harm results. As the lower pole of the lens emerges from the wound, the forceps grip may be relinquished and expression completed solely by a gentle, lateral sweeping movement of the hook, which has followed the lens up from below. If the forceps grip seems secure it may be retained and the extraction concluded, so that the lens emerges still in the grasp of the forceps, though it is followed up from below with the hook, which thereby assists delivery and simultaneously replaces the cornea, so closing the wound.
10. The flap suture is tied.
11. We carry out an unhurried toilet of the wound, and if necessary, spend some time massaging the iris into position until we are satisfied that it is quite free.
12. The bridle suture is removed, atropine and argyrol are instilled, the lid stitch is fixed with a small piece of strapping to the cheek, and a double eye pad is applied.

Post-operative Care.

1. The patient is put to bed propped up, and the first dressing is done twenty-four hours later.
2. Usually one eye is uncovered on the third or fourth day, though we do not hesitate to uncover the unaffected eye on the day after operation if we feel that the binocular dressing is causing undue restlessness.
3. Patients are allowed out of bed on the fourth or preferably the fifth day.
4. The flap suture usually cuts out about the fifth day. If not, it is removed at any time from then on.
5. The patient's discharge from hospital is considered safe from the tenth day onwards, but it is usually delayed until the twelfth or thirteenth day.

Complications.

As I have mentioned, the most serious complication is that of vitreous loss. If this occurs before the lens delivery has progressed far, it is a serious mishap which calls for the use of some type of vectis or scoop. I am glad to report that in our series of cases this has never been necessary. In fact, we have had only one case in which vitreous presented. This was that of a male patient, aged twenty-one years, who had cataracts due to high-voltage electricity, and congenitally defective vision and nystagmus.

It is to meet just such an emergency that we regard some type of wound suture as imperative. We are satisfied that the simple suturing of the conjunctival flap is effective, but there are many who prefer some type of corneo-scleral stitch. One present difficulty in the insertion of this stitch is the inability to obtain suitable needles, which should preferably be of the atraumatic variety. The coaptation of the wound edges by suture minimizes the hazard of vitreous loss to such an extent that it may be regarded, if not with equanimity, certainly with infinitely less anxiety than it would otherwise engender. Minor vitreous loss following delivery of the lens, although not experienced by us, need not be viewed with alarm so long as the suture has been inserted prior to delivery, so that it can be promptly tied.

Rupture of the capsule may occur at any stage of the lens delivery, and is more likely if the forceps grip is retained throughout. In this event operation proceeds as in the ordinary extracapsular method of cataract extraction. If dislocation of the lens is not effected in spite of forceps traction and hook pressure, which may be continued for some time, and if it is thought that the safe limits of these manipulations have been reached, we have made it a practice to abandon them, and to proceed with a capsulotomy extraction. This is not a frequent difficulty, and we have found that the incidence of this complication decreases as the experience and dexterity of the operator grow. I think we have been inclined to err on the side of undue caution when we have been unable to dislocate the lens at this stage; but perhaps the infrequency of vitreous loss has been our reward.

Convalescence.

One of the noticeable and impressive features of the convalescence is the general absence of post-operative reaction. Many of the cataracts removed have been very immature, and even with thorough irrigation to remove cortical remnants, we are convinced that a similar series of cases dealt with by the extracapsular technique would have resulted in some instances of *iritis phakoanaphylactica*. Occasionally some striation and haziness of the cornea persist for a few days, but these conditions have never been permanent. With regard to choice of patients for operation, in general it may be said that any uncomplicated cataract is suitable for attempted intracapsular extraction. In some cases associated with iritic adhesions or degenerate vitreous, and in some of hypermature cataracts, probably this approach should not be used; but all cases should be made the subject of individual decision. The opinion is held that patients in the later age groups have suspensory ligaments which rupture more readily, but it is possible to perform the operation on young adults with excellent visual results, as confirmed by the case to which I have made earlier reference.

Our series of patients, under thirty in number, is perhaps a comparatively small one upon which to base firm conclusions

or to express dogmatic opinions. They were unselected patients and included two diabetics, one with moderately high myopia and one with traumatic cataract. The visual results have been uniformly good. We have had no prolapse of iris and no post-operative iritis; hyphæmia has been noted twice, but the hæmorrhage has absorbed without incident. The average duration of stay in hospital has been less than a fortnight.

It may be argued that our technique is much more elaborate and time-consuming than that required for the classical method of extraction. This is admitted, but we believe that it is justified by results.

Summary.

A simple technique for intracapsular extraction of cataract has been described. It has been proved safe and suitable for most cataract patients requiring operation, and has given admirable visual results with only one operation, and an average stay in hospital of less than two weeks. Should rupture of the zonule prove difficult or impossible, it may be abandoned in favour of capsulotomy extraction, the only unnecessary step for which has been the needlessly large corneal section, which in our experience, heals without any complications.

Conclusion.

By August, 1944, the number of patients operated on along the above lines has risen to well over fifty.

Our results and our experience and observations lead us to believe that intracapsular extraction can be carried out in most cases with safety and with advantage to the patient. The operative technique is capable of being mastered by anyone skilled in cataract surgery, and in such hands, with proper pre-operative exclusion of obviously unsuitable patients, we believe that it should be regarded, not with apprehension or scepticism, but as the operation of choice.

Reports of Cases.

TOTAL PNEUMONECTOMY FOR CANCER.[1]

By M. P. SUSMAN,
Sydney.

Clinical Record.

J.F., a male patient, aged fifty-three years, suffered from pneumonia in December, 1942, and made an incomplete recovery; he was left with a persistent cough productive of a little offensive sputum and with undue breathlessness on exertion. In November, 1943, his sputum was blood-stained for four days. His other main symptoms were loss of weight (fourteen pounds in a year), pain in the left hemithorax, night sweats and increasing fatigue. X-ray examination revealed an irregular opacity at the base of the left lung, and corresponding to it were general impaired resonance and distant vesicular breath sounds with scattered râles. Bronchograms revealed defective filling of the basal bronchi of the lower lobe of the left lung, and bronchoscopy revealed that this was due to vascular tissue which was found on microscopic examination to be carcinomatous. As there were no signs of metastases and as his general condition was satisfactory, after consultation with my medical colleague, Dr. Bruce White, I advised operation. Pneumothorax was induced twelve days before operation, and the patient tolerated it well.

On February 2, 1944, I removed the whole of the left lung, after ligating separately the pulmonary artery and veins and the bronchus. Dr. R. Robinson conducted the anæsthesia most skilfully, using a basal dose of "Avertin" and a nitrous oxide, oxygen and ether mixture in a closed circuit with absorption of carbon dioxide. The continuous intravenous administration of glucose and saline solution was begun before operation, and blood transfusion was substituted during the operation. His blood pressure dropped seriously towards the end, but his pulse rate never exceeded 120 per minute and his condition throughout was moderately good. I passed a bronchoscope at the end of the operation to clear the tracheo-bronchial tree and noted that the bronchial stump was soundly closed.

[1] This patient was shown at a clinical meeting of the New South Wales Branch of the British Medical Association at the Royal North Shore Hospital of Sydney on June 22, 1944.

The technique of operation was as follows. The patient was placed on his right side, and the fifth left rib was resected from the costal cartilage to the transverse process; the thoracic cavity was opened throughout the whole length of this rib bed. The upper lobe looked and felt normal, but the lower lobe was blue and a hard mass was to be felt within it. As the hilum was free, and as no pleural deposits were present, I set out to isolate the structures at the hilum by incising the pleura all round. Adhesions between the base and the diaphragm were troublesome. The only other difficulty occurred when I removed a large lymph node lying between the bronchus and the aorta; free but not alarming hæmorrhage took place which I finally had to control by gauze packing (the gauze was brought out through a stab wound in the mid-axillary line).

Interrupted silk sutures were used to close the bronchus and the pulmonary vessels individually; for the bronchus I used a proximal row of three mattress sutures and a distal row of five simple sutures; for each of the great vessels one transfixion suture and one surrounding ligature were used. The pleural cavity was washed out with saline solution, and sulphanilamide powder was scattered over the hilar region; then the mediastinal part of the pleura was partly closed with interrupted sutures, and the main wound was closed without drainage by three layers of continuous catgut sutures for the deep tissues and continuous cotton sutures for the skin, reinforced by six interrupted sutures of silkworm gut.

After the post-operative bronchoscopic examination the patient was given oxygen continuously for six days. His convalescence was satisfactory at first. On the third day the piece of gauze was removed. Fluid gradually appeared and soon half-filled the pleural cavity. The wound was soundly healed by the twelfth day and the patient was well except for slight cough and mild fever. Fluid was aspirated periodically; it was blood-stained and sterile for five weeks, and then a bronchial fistula developed and the fluid became purulent. A drainage tube was inserted under local anæsthesia, and his condition soon improved again; the bronchial fistula closed and irrigations were given. As the predominant organisms are Gram-positive, a trial is being made of injecting penicillin into the pleural cavity and keeping the tube clamped. It is hoped that a sterile fibro-hydrothorax will form and that no further treatment will be required; but should sepsis persist, thoracoplasty will be necessary to obliterate the infected pleural space. His condition now is good and still improving, and he is afebrile.

Discussion.

It is now generally accepted that radical operation is the only cure for cancer of the lung. Radiotherapy is usually fruitless, and too often it only makes the patient ill; but occasionally it is of value as a palliative. I have a patient alive and well, with no bronchoscopic evidence of growth, five years after intrabronchial treatment with radon and external deep X-radiation; the diagnosis had been made from histological examination of the tissue removed through the bronchoscope, and later reexamination of the sections has confirmed the diagnosis of cancer.

Although there are many variations in the operative technique, the main steps have gradually become standard and have been outlined above. If patients are to be chosen before it is too late for operation, their medical attendants must ever have in mind the possibility of cancer in middle-aged persons (though no age is exempt) who have "unresolved pneumonia", blocked bronchus or persistent cough, especially if the sputum is blood-stained. Cancer of the lung is common and it is the great imitator of pulmonary diseases; if it is suspected, further investigations should be made. These investigations include ordinary radiography and bronchography, radiography and thoracoscopy after a diagnostic pneumothorax has been induced, puncture of the lung to obtain tissue for biopsy, and examination of the sputum for malignant cells. But bronchoscopy is the most important examination of all and may of itself be conclusive; the exact site of bronchial obstruction can be defined and pieces of tissue can usually be obtained for examination, since most bronchogenic cancers are in the main or secondary bronchi; mediastinal metastases may be evident from widening and fixation of the tracheal bifurcation, or the growth may be seen to have spread to the trachea. Such findings would obviously contraindicate operation, and there is no excuse for submitting a patient to operation without a preliminary bronchoscopic examination. If all these investigations still leave the diagnosis in doubt, exploratory thoracotomy may be the final appeal. The radical operation must always be a serious one, with an immediate mortality rate of 10% to 20% and many later deaths from recurrence or metastases; but even so, the

number of survivors is appreciable, and there are now many case records from different parts of the world of five to ten years' survival after operation.[1]

Reviews.

A YEAR BOOK OF SURGERY.

ONCE again we welcome the Year Book of General Surgery; this time it covers the year 1943.[2] The editor, Evarts A. Graham, complains in the preface that progress in scientific knowledge has been retarded to such an extent during the war that readers may think that the present volume is less rich in new ideas than its predecessors. This may be true, but all the same the volume is of much interest and cannot fail to hold the attention of any practitioner interested in surgery who goes to it for help.

In the section on military surgery reference is made to several articles that deal with immersion blast injuries. In the section on wound healing and pathological complications there is published an abstract of a report by the Subcommittee on Surgical Infections appointed by the National Research Council to study the prevention of infection in contaminated accidental wounds, compound fractures and burns. The conclusion is that sulphonamides minimize the general spread of infections and cut down the incidence of septicæmia and death. No evidence was found that these drugs lessen the incidence of local infection. To decrease incidence of local infection in war wounds and burns, some other forms of the sulphonamides or some other bacteriostatic agents must be found which will be effective against the contaminating organisms in the presence of damaged tissue. In drawing attention to the report, the editor also mentions an article by Sutliff, Helpern, Griffin and Brown, who reported that sulphonamide toxicity was given as the cause of death in 28 cases in New York City in 1941. In the section on fractures a description is given of the Stader reduction splint for the treatment of fractures of the shafts of long bones; the technique of its application is given and the pins and bars are shown in an illustration attached to the femur. An interesting reference is made to pilonidal cysts and the section on the gall-bladder and bile ducts is well worth reading. The apparatus described by W. A. Pryor in this journal for use with the Thomas leg splint when it is to be applied to fully dressed subjects in first-aid transportation is illustrated.

This book will be of use to all medical practitioners who undertake any surgical work.

ALLERGY IN PRACTICE.

RECENT years have witnessed growing interest in the problem of allergy, owing largely to the realization that allergic reactions may occur in any tissue of the body. In some instances, allergy has been claimed as the cause of groups of indefinite symptoms and diseases of doubtful ætiology. Feinberg's recent publication, "Allergy in Practice", reviews the problem in such a comprehensive manner that it should serve to place the subject on a sound basis.[3] In view of the widespread manifestations of allergy, a study of this book should be of practical value to all practitioners, irrespective of the particular branch of medicine in which they may be interested.

There is a short chapter dealing with the history of allergy, followed by a general discussion on hypersensitivity and the numerous allergens which may provoke symptoms. The symptoms and treatment of the various manifestations, such as asthma, hay fever, skin lesions, abdominal and ophthalmic symptoms, and migraine, are dealt with in detail.

As Feinberg points out, there is no easy road to success in treating the allergic patient. We do not know how to alter the basic constitution which predisposes to sensitization. It is still necessary either to avoid the offending substances, or to attempt to lessen the hypersensitive state by a process of desensitization. This frequently necessitates months or years of observation and treatment.

The chapter concerning pollens is detailed and comprehensive for the United States, but of necessity, only brief reference is made to other countries.

Allergy to fungi is given a prominent place, and a thorough study of this aspect should enhance the prospect of the successful treatment of hay fever and asthma.

An important part is played by cold either as an actual physical allergen or in precipitating symptoms due to other substances. Most patients who suffer from nasal or bronchial allergy realize this and often adopt extreme measures to avoid contact with cold air.

The treatment of asthma is discussed in particular detail with attention to all methods of combating the attack as well as those necessary for the prevention of further attacks. Feinberg states that tonsillectomy practically never cures asthma, although there is frequently some temporary improvement, due, in his opinion, to the shock-like effect produced by necrotic tissues in the throat and possibly also to the anæsthetic. For this reason he advises tonsillectomy only when there is a history of sore throats. Bacterial allergy as a factor in the production of asthma lacks definite proof.

Support is given to the modern conservative trend in the surgery of allergic nasal conditions, whilst the author points out that superadded infection may at times need more radical treatment. In all these conditions it is important to recognize and attempt to combat the underlying allergic state.

The space devoted to allergy of the digestive tract is comparatively small, although, in Feinberg's own opinion, allergic symptoms in the digestive tract combine to form a formidable total of allergic illness. Rowe's work concerning food allergy and his elimination diets are fully quoted, and this method of approach is very helpful in dealing with difficult abdominal allergic reactions. Attention is drawn to a tendency to label many vague abdominal symptoms as allergic and to the possibility of overlooking organic disease. A point not mentioned, however, is the number of allergic abdominal conditions which are still being treated surgically or labelled functional.

Whilst recognizing the fact that nervous and emotional disturbances may aggravate allergic symptoms, the author expresses the opinion that many nervous states and mental complexes present in allergic patients are the result of the suffering and annoyance of the allergic syndrome. This may not be in accordance with general opinion, but undoubtedly, nervous and mental symptoms disappear with the improvement of long-standing and often unrecognized allergic states. Angioneurotic œdema, however, is frequently precipitated by nervous factors in a person with no previous history of allergy and will frequently disappear with the removal of the nervous stress.

A study of this book should help to prevent an attitude of hopelessness towards these problems and at the same time encourage more patience and perseverance in treatment.

NEUROSYPHILIS.

"THE MANAGEMENT OF NEUROSYPHILIS", by Dattner, Thomas and Wexler, presents a comprehensive survey of the methods of diagnosis and treatment of syphilitic affections of the nervous system.[1] The principal author, Dr. Dattner, was formerly an assistant in the Vienna clinic of Wagner-Jauregg.

For a century after its recognition as a clinical entity, general paralysis of the insane defied all efforts at treatment and was recognized as a universally fatal disease of rapid evolution. Wagner-Jauregg in 1917 inoculated a number of paralytics with malaria and succeeded in arresting the disease in some and in prolonging the duration of life of most of the patients.

The discovery of adequate therapeutic measures immediately placed emphasis on the early diagnosis of general paralysis and also of tabetic and meningo-vascular forms of neurosyphilis. The authors of this book repeatedly insist on the importance of diagnosis and rightly urge that a judgement as to the activity or otherwise of a neurosyphilitic process can be based only on the results of examination of the cerebro-spinal fluid.

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[1] The tube was finally removed on July 1 and the patient has remained well. A skiagram on August 2 showed a small collection of fluid, deviation of the mediastinum to the left and raising of the left dome of the diaphragm.

[2] "The 1943 Year Book of General Surgery", edited by Evarts A. Graham, A.B., M.D.; 1943. Chicago: The Year Book Publishers, Incorporated. 7" × 4", pp. 736, with illustrations. Price: $3.00.

[3] "Allergy in Practice", by Samuel M. Feinberg, M.D., with the collaboration of Oren C. Durham; 1944. Chicago: The Year Book Publishers, Incorporated. 9" × 6", with illustrations. Price: $8.00.

[1] "The Management of Neurosyphilis", by Bernhard Dattner, M.D., Jur.D., with the collaboration of Evan W. Thomas, M.D., and Gertrude Wexler, M.D., with a foreword by Joseph Earle Moore, M.D.; 1944. New York: Grune and Stratton. 9" × 6", pp. 398. Price: $5.50.

Part I of the book deals with the technique of lumbar and cisternal puncture and with the tests applicable to cerebro-spinal fluid, and the significance of the various pathological reactions is carefully evaluated from the point of view of diagnosis and prognosis. The authors discuss headache after lumbar puncture with respect to cause and treatment. They express the view that during the first few years after infection changes in the spinal fluid fluctuate, but they consider that a positively reacting fluid by the fifth year after infection is a danger signal of active invasion of the central nervous system, while conversely a "negative fluid" at this stage is unlikely to become positive at a later date. The spinal fluid syndromes associated with paretic, tabetic and meningo-vascular syphilis are described in detail.

Part II is devoted to an almost encyclopædic account of the methods available for the treatment of neurosyphilis. Considerable space is given to the description of the technique of malaria therapy and of various substitute forms of fever treatment, as well as to chemical and physical methods of inducing pyrexia. The authors discuss the use of specific drugs and devote special attention to the subject of trivalent and pentavalent arsenical preparations. They advise against the use of tryparsamide when optic atrophy is present.

The authors emphasize that the yard-stick of therapeutic success is the reversal of spinal fluid syndromes and point out that this process is first seen in the return of the cell count to normal, secondly in fall of protein values, while complement fixation reactions may remain positive for years; but once the spinal fluid becomes normal it remains normal. These are valuable guides to the physician in interpreting the results of spinal fluid tests and in forecasting the results of treatment.

In the treatment of paresis, the authors favour malaria followed by intravenous injections of pentavalent arsenic. They indicate that they have adopted at Bellevue the plan of giving ten successive daily injections of 0·06 gramme of "Mapharsen" immediately after malaria has been terminated and claim that the therapy has been well tolerated and is very effective in producing reversal of spinal fluid findings. In contrast to paresis, tabetic and meningo-vascular forms of neurosyphilis do sometimes respond to ordinary antisyphilitic treatment with arsenic and bismuth; for those cases which are resistant to standard treatment a course of malaria is recommended.

Finally the authors discuss the question of prophylaxis of parenchymatous neurosyphilis. Throughout, they err rather on the side of understatement and support their arguments with personal case records and reports from literature. They give a very complete bibliography.

This book is a valuable source of information concerning the diagnosis and treatment of neurosyphilis and could be read with profit by neurologists, psychiatrists and syphilologists, and it is to be hoped that its message will reach the general practitioner on whom the responsibility for diagnosing early neurosyphilis mostly falls.

A YEAR BOOK OF PÆDIATRICS.

"THE 1943 YEAR BOOK OF PEDIATRICS" has been published.[1] The editor is I. A. Abt, and he has had the collaboration of A. F. Abt. The work as usual is divided into several sections. One of the most important is that devoted to nutrition and gastro-intestinal diseases. Among the subjects dealt with here are studies on the vitamins—the dangerous effects of vitamin *D* overdosage on dental and paradental structures, the problems presented to the practising physician by vitamins of the *B* group, vitamin *K* and the prevention of hypoprothrombinæmia in the newborn, vitamin *A* and the total lipid of the serum in pneumonia. Subdiaphragmatic abscess in children and various types of intestinal disturbance are also considered. Hipsley's observations in obstruction of the œsophagus in infants and children are mentioned. The occurrence of three attacks of acute intussusception within one year in a girl aged five and a half years is recorded. The use of sulphanilamide as a prophylactic agent in acute rheumatism and rheumatic manifestations is considered both under the heading of rheumatism and under that of therapeutics and toxicology; it is rather surprising that more has not been heard of this important measure. Reginald Miller's paper from *The Lancet* on juvenile rheumatism is quoted, and the responsibilities of the medical practitioner in the problem of rheumatic fever in children are emphasized by A. E. Hansen in a paper published in the American *Journal-Lancet*. As might be expected, *erythroblastosis fœtalis* and other blood conditions such as nutritional iron deficiency anæmia and jaundice of the newborn are discussed, and prominence is given to the discussion on nutritional anæmia in children and women as a wartime problem held at the Royal Society of Medicine, London, in December, 1942. Tuberculosis is discussed in several of its aspects. The sulphonamides are mentioned extensively. There is a special section devoted to allergy. There is another on surgery and anæsthesia. In the section on miscellaneous conditions reference is made to preventive pædiatrics in private practice and also to the child in war. Reminding us of the war, there is a title, "Bridgeheads of Child Health in the Five Ages of Childhood".

The subjects mentioned show that the pædiatrician will find a great deal to interest him in this volume. The general practitioner will also find his interest held. This is a book that may be opened with profit at any place in an odd moment. Its arrangement also makes it suitable for systematic study.

[1] "The 1943 Year Book of Pediatrics", edited by Isaac A. Abt, D.Sc., M.D., with the collaboration of Arthur F. Abt, B.S., M.D. Chicago: The Year Book Publishers, Incorporated. 7" × 4¾", pp. 448, with illustrations. Price: $3.00.

THE HISTORY OF CÆSAREAN SECTION.

IN a very complete account of the history and development of the Cæsarean operation from the earliest times, Dr. J. H. Young diligently quotes chapter and verse from every available source of information on the subject, and for this reason his book, "The History of Cæsarean Section", will be of inestimable value to research workers in this particular aspect of obstetrical practice.[1] It is conceivable, however, that the hard-pressed medical practitioner who delves into these pages may occasionally experience periods of mental fatigue in the endeavour to concentrate his attention on the inevitable dates with the accompanying unhappy fates of a long series of cases. In these enlightened times no other surgical procedure commands the same glamorous interest or is performed with equal dramatic effect in the hands of a competent surgeon, but technical perfection has been achieved only after centuries of painful trial and error on the part of many courageous pioneers who endeavoured to overcome an insuperable difficulty often at the risk of incurring social and ecclesiastical censure. If the author of this book has not succeeded in providing easy entertainment for the average reader, he has at any rate for the more seriously minded presented a most comprehensive survey of all the literature on the subject from Cæsar to Saenger.

The authentic history of the operation has been divided into three periods. The first period covers centuries before the year 1500 when it was occasionally performed after the death of the mother in the hope of saving the child. The second period commences with the desperate attempt of the sow-gelder, Jacob Niefer, to save the life of his own wife, and with a razor he performed the first successful Cæsarean operation on a living subject. In Great Britain the first successful operation was performed in January, 1738, on the wife of a farmer at Charlemont in Ireland by an illiterate midwife, Mary Donally, who also used a razor to make the incisions. Further on we read of the Baptist minister and physician, John Lambert Richmond, of Newton, Ohio, who in April, 1827, used his small pocket case of surgical instruments to perform the Cæsarean operation in a backwoods log cabin, thus saving the life of a coloured *primipara* who was apparently in the throes of eclampsia. The patient made a good recovery and the case was reported in 1830 as the first successful Cæsarean operation in the United States of America.

The third period commences with the operation invented by Professor Porro, of Pavia, in 1876, followed shortly afterwards by a method devised by Max Saenger for thorough suture of the uterine incision. In later chapters the author clearly demonstrates the manner in which continued improvements in technique, together with the tremendous benefits conferred by the advent of general anæsthesia and the development of aseptic principles, contributed throughout this period to the attainment of far more encouraging results. Whereas the operation in earlier years had been attended with a tremendously high mortality, it could now be considered a wise and safe procedure when performed under proper conditions.

[1] "Cæsarean Section: The History and Development of the Operation from Earliest Times", by J. H. Young, M.B., Ch.B., D.T.M. and H. (Edinburgh), with a foreword by Miles H. Phillips, M.D. (Hon.), B.S., F.R.C.S., F.R.C.O.G.; 1944. London: H. K. Lewis and Company, Limited. 8½" × 5½", pp. 261. Price: 16s. net.

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MYASTHENIA GRAVIS.

THE disease known as *myasthenia gravis* presents a formidable problem in pathogenesis. Most clinicians asked to set out what they knew of the condition would describe it as one characterized by abnormal muscular weakness leading ultimately to paralysis of certain groups of muscles, particularly muscles of the face and muscles whose nerve supply comes from the medulla. They would also add that when prostigmin is injected into the patient the muscle weakness and fatigue are temporarily abolished. As a matter of fact, though a great deal of interesting work has been done on the subject, little more than this can be regarded as determined beyond any doubt. The pathology is obscure. Kinnear Wilson in his well-known text-book on neurology states that scores of cases have been submitted to minute histological study without any definite result, whereas in others clearly marked lesions have been observed. Apart from two features which he mentions, he looks on the underlying lesions as "curiously indeterminate". The features mentioned by him include the deposition in myasthenic muscles of masses of small round cells, indistinguishable from lymphocytes and known as lymphorrhages. He points out that myasthenic muscle often undergoes mild toxi-degenerative change or simple atrophic involution. Another common lesion referred to by Kinnear Wilson is a persistent and enlarged thymus gland, found, he thinks, in perhaps 50% of cases. Though the "tumour" has been diagnosed and labelled with different names, Kinnear Wilson states: "In general, perhaps, the enlargement can properly be considered a benign thymoma, firm and lobulated, lying over upper pericardium and extending into anterior mediastinum; its consistency and volume vary much in different specimens." The obscurity of the problem of pathogenesis is due to the undetermined pathology and to the fact that "such lesions as distinguish perhaps one half of the cases throw no light on the mechanism of symptoms or evolution of the disease".

Before reference is made to the different views advanced for the causation of *myasthenia gravis*, it is well to recall that a substance known as acetylcholine is produced at certain neuro-muscular junctions on the arrival of a nerve impulse and that this substance by chemical means "transmits the effects of the nerve impulse from the nerve endings to many of the specialized cells in the organs and tissues throughout the body, producing in those cells a physiological reaction either of stimulation or inhibition". Neither the way in which acetylcholine is produced nor its origin is known (a discussion on these points will be found in Best and Taylor's book on the physiological basis of medical practice); acetylcholine is known, however, to be rapidly hydrolysed by cholinesterase, an enzyme that is present in motor end plates and sympathetic ganglia. The views that have been put forward to explain *myasthenia gravis* have all centred round the liberation of acetylcholine and the inhibition of its action. Interest in the causation of myasthenia was awakened in 1934 when Mary Walker showed that prostigmin, an analogue of physostigmin, was capable of bringing about considerable, though temporary, improvement in the muscle power of patients suffering from the disease. Since then a large literature has grown up around the subject which may be considered in the light of some of the more recent contributions.

From Sheffield in England there has recently come an interesting study of fourteen cases of *myasthenia gravis*.[1] The authors, Andrew Wilson and H. Berrington Stoner, are attached to the department of pharmacology and therapeutics in the University of Sheffield. They state at the outset of their report that the modern conception of the mechanism at fault in *myasthenia gravis* centres round certain possible physiological disturbances. They set out the following three possibilities that have been investigated: (i) That the cholinesterase activity of the myoneural junction is abnormal and does not permit the normal action of acetylcholine. (ii) That the amount of acetylcholine liberated at the myoneural junction is less than normal. (iii) That some by-product of acetylcholine prevents the normal action of acetylcholine, or that some "curare-like" substance blocks the receptor mechanism with a similar effect. In regard to the first of these possibilities Wilson and Stoner examined the cholinesterase activity of the serum of fourteen patients with *myasthenia gravis* and of six normal adults. Determinations were made in duplicate and the findings were subjected to statistical scrutiny. The conclusion reached was that serum in myasthenia does not differ significantly from normal serum in cholinesterase activity; no evidence was found that the muscular weakness in *myasthenia gravis* is due to an excessively rapid destruction of acetylcholine by cholinesterase. These findings are in accord with those of other workers. Among these are Torda and Wolff, who excluded the possibility of excess destruction of acetylcholine by esterase and who showed that plasma from patients with *myasthenia gravis* allows less synthesis of acetylcholine than does that of normal patients. These findings are quoted by E. R. Trethewie and R. D. Wright in the report of a recent study.[2] Trethewie and Wright also refer to the fact that Odom, Russel and McEachern have shown "that there is no increase in the amount of

[1] *The Quarterly Journal of Medicine*, January, 1944.
[2] *The Australian and New Zealand Journal of Surgery*, April, 1944.

esterase in the blood of 'myasthenia' patients". Again, A. B. Corkill and A. H. Ennor, of Melbourne, reported in this journal in the issue of December 25, 1937, the results of an investigation which led them to conclude that the condition of two myasthenic patients could not be accounted for by an increased cholinesterase activity of the blood. These observers also refer to findings by Stedman and by McGeorge pointing in the same direction. These few references will show that there is a good deal of support for the refusal of Wilson and Stoner to accept the first of their "possibilities". The only available opinion to the contrary of comparatively recent date is that of C. Stanton Hicks and Margaret McKay,[1] who, reporting the investigation of a patient with *myasthenia gravis*, stated that: "At no time during the investigation, which covered five months, did the blood of the patient show anything but excessive esterase activity, which increased with the severity of the disease and diminished with treatment by prostigmin injection."

Turning to the second of Wilson and Stoner's possibilities, we note that Fraser, McGeorge and Murphy carried out experiments from which they concluded that there is a defect in the production of acetylcholine and that the site of this defect is the neuro-muscular junction. (See THE MEDICAL JOURNAL OF AUSTRALIA, December 11, 1937, page 1046.) Trethewie and Wright (*loco citato*) state that Torda and Wolff produced evidence for a defective synthesis of acetylcholine. Trethewie and Wright report some experiments in which they detected an increase in acetylcholine synthesis when "normal" thymus was added to brain extracts, and in which a decrease in acetylcholine synthesis was observed when thymus from a severe case of *myasthenia gravis* was added to brain extract. In their discussion they write:

> Since there is an increasing weakness on exertion, it seems, from the clinical aspect, that the condition of the patient is not necessarily due to an initial diminution of acetylcholine, but that return to the condition prior to exertion does not take place. It is to be noted that more than the initial content of acetylcholine can be liberated from the cervical ganglion following stimulation of the preganglionic fibres, and fatigue with depleted depots in thus guarded against. With *myasthenia gravis*, however, the deficiency appears to result from inability to refill the depot so that after exertion the condition is worse than before.

Wilson and Stoner discuss the work of Fraser, McGeorge and Murphy. They record some experiments of their own in which the injection of pilocarpine nitrate failed to produce positive results. They characterize their own work as interesting, but admit that it does not refute the arguments of Fraser and his colleagues.

The third possibility—the possibility of a substance blocking the action of acetylcholine—is next for consideration. In 1938 Mary Walker demonstrated to the Section of Neurology of the Royal Society of Medicine a patient suffering from *myasthenia gravis* in whom fatigue of the muscles of the forearm could induce paralysis of the extraocular muscles.[2] She occluded the circulation of the upper limbs and made the patient exercise the muscles of the forearm. On release of the constriction of the arms an increase in ptosis of the patient's eyelid occurred after a short latent period. Wilson and Stoner have repeated Walker's experiments. In 12 out of 14 cases they obtained a response similar to that described by Walker; the findings were determined by clinical observation and cine-camera photographs. Observations were also made by a specially constructed ergograph, and these supported the findings already mentioned. Wilson and Stoner point out that they showed in 1943 that the effect described by them is not due to an increase in the cholinesterase activity. From observations made during medication with prostigmin they regard it as obvious that prostigmin interferes with or modifies the action of a circulating substance. To determine the presence in the serum of a substance with a curare-like action they used a muscle-nerve preparation of a frog, treated it with serum and stimulated the nerve. The serum was obtained (*a*) from thirteen patients suffering from *myasthenia gravis* and withdrawn both during occlusion of the circulation before exercise and during occlusion of the circulation after exercise; and (*b*) from six normal persons and withdrawn under the same conditions as those adopted for the myasthenia patients. With the serum from the normal persons no change in the height or shape of the muscle contraction curve could be detected. In the myasthenia group the serum of eleven patients produced a depression of the normal muscle contraction. With the serum taken before exercise the depression of muscle contraction was never greater than 25%; with the serum taken after exercise the depression was sometimes so great that no response followed stimulation of the nerve. From these and other experiments of a similar kind Wilson and Stoner conclude that there is in the blood of patients with *myasthenia gravis* a substance which produces a block in neuro-muscular transmission, and further that prostigmin exerts some action which neutralizes or inhibits the action of this substance.

From this short review of the work carried out by Wilson and Stoner and by others mentioned it is clear that the subject is most complex. When the pathology and the strange, though occasional, associations of the conditions are borne in mind it is clear also that there is no satisfactory explanation for all the facts. Some curious features must be noted. In the first place myasthenic patients appear to be susceptible to sunlight and its associated warmth. Wilson and Stoner discovered that one of their patients had a sudden increase in the severity of his condition on a hot sunny day. They then found that eight of their other patients avoided exposure to sunlight and stated that unless they sat in the shade they became very weak, and ptosis, diplopia and dysphagia developed quickly. This increased fatigability was noted in the voluntary muscles, but in no instance was there any weakness of the circular muscle fibres of the iris. Exposure to heat from electric or coal fires had no effect on the condition. The comment by Wilson and Stoner is that they would like to know whether particular wave-lengths of light are responsible for the phenomenon. Some authors describe remissions in the disease, but Wilson and Stoner did not find remissions to be a constant feature—they found the condition to fluctuate, but there were usually some manifestations of its presence. The most striking remission has been found to occur during pregnancy. Remissions of this type were discussed at some length in 1942 by H. R. Viets, R. S. Schwab and M. A. B. Brazier.[1] The remissions described by these

[1] *The Australian Journal of Experimental Biology and Medical Science*, Volume XIV, 1936, page 275; THE MEDICAL JOURNAL OF AUSTRALIA, June 27, 1936, page 894.

[2] *Proceedings of the Royal Society of Medicine*, Volume XXI, 1938, page 722.

[1] *The Journal of the American Medical Association*, Volume CXIX, 1942, page 236.

authors lasted in some instances for months. Only one of Wilson and Stoner's patients became pregnant during the course of the disease. This patient's myasthenic condition was unaffected by either pregnancy or labour. That in certain cases there may be an association with endocrine conditions is also suggested by the occasional linkage with thyreoid abnormalities and the more frequent involvement of the thymus. An example of association with Graves's disease was reported in this journal by Richard Flynn in the issue of April 15, 1944. As already stated, the thymus is held to be involved in about 50% of cases of *myasthenia gravis*. A. Blalock, A. M. Harvey, F. R. Ford and J. L. Lilienthal have discussed removal of the thymus in the treatment of *myasthenia gravis*,[1] and in this regard reference must again be made to the paper by Trethewie and Wright. Blalock and his collaborators report "encouraging" results from the removal of the thymus and express the view that it may be somehow concerned in the genesis of *myasthenia gravis*; they also quote the opinion of E. H. Norris that changes in the thymus are found in *myasthenia gravis* in proportion to the care with which they are sought. Wilson and Stoner could find no evidence of thymic change in any of their fourteen cases; they regard this as confirming the view of Blalock and his co-workers that clinical and radiological studies are of no value in determining the condition of the thymus. If, as indeed we must, we put these curious features of the disease on one side and label them as not understood, and if, as seems justifiable on present evidence, we postulate the presence of some substance, which operating alone or in conjunction with some other factor so far undiscovered, blocks the action of acetylcholine, we still have to explain why certain muscles are affected by the disease and others escape involvement. This selective involvement, if we may use the term, is found in many conditions of the nervous system, but this is not an explanation. It does not seem justifiable to postulate any peculiarity of the nerve terminations in the affected muscles. We must also remember that though lymphorrhages are found in this disease, we know nothing of their significance; indeed the function of the lymphocytes in general is obscure. All that we can do at present is to await the results of further research. To a certain extent research on the physiology of the neuromuscular apparatus and research on *myasthenia gravis* wait on one another, and the results of either may throw light on the problems of the other.

Current Comment.

THE USE OF PROSTIGMIN IN RHEUMATOID ARTHRITIS.

THE effect of prostigmin in *myasthenia gravis* is believed to be inhibition of acetylcholinesterase, which has a destructive action on acetylcholine. In other words, prostigmin permits the activity of acetylcholine and so increases skeletal muscular strength and delays fatigue. But, as shown by H. Kabat and M. D. Knapp, prostigmin has another action—the relaxation of spastic muscle. Kabat and Knapp believe that the drug acts directly on the spinal cord and that it has a depressing or a stimulating effect, depending on the neurones affected by it. Philip R. Trommer and Abraham Cohen have used prostigmin (or, as they prefer to call it, neostigmine) in the relief of muscular spasm in rheumatoid arthritis.[1] They point out that "muscle spasm persists even though the arthritic process has become quiescent, and results in limitation of motion, deformities, weakness, fatigue and pain on pressure or stretching of the affected part". They treated with prostigmin a series of nineteen patients "all of whom had rheumatoid arthritis or similarly related conditions". Each patient had been under observation for a period of some months, and each had "a maximum of deformity and definite loss of function and limitation of motion, but a minimum of active joint involvement". Many of them had received treatment with gold salts. Before treatment with prostigmin was commenced, the patients were subjected to careful physical examination and special attention was paid to the degree of deformity. An estimate of the patient's ability to perform certain common movements was made. Treatment was usually started with a subcutaneous injection of 1·0 cubic centimetre of a one in two-thousand solution of prostigmin methylsulphate (0·5 milligramme of the drug) together with 0·6 milligramme of atropine sulphate. The injection was repeated on alternate days. In addition 7·5 to 45·0 milligrammes of prostigmin bromide, usually with 0·6 to 1·2 cubic centimetres of tincture of belladonna, were given daily by mouth in most cases. The sole object of the atropine or belladonna was "to forestall any possible undesired effects of neostigmine on the myoneural junctions of the parasympathetic nervous system".

Of the nineteen patients, thirteen responded favourably to the treatment. The remaining six obtained either slight relief or none. A number of case histories are given. An elderly woman suffering from rheumatoid arthritis of the joints of upper and lower limbs was observed to have slightly easier movements of the fingers within a few minutes of the injection of prostigmin. She was given an oral dose of 15·0 milligrammes three times a day, and within forty-eight hours she was able to shut her fists and dig her finger nails into her palms; she was able to rise from a recumbent position without assistance, and whereas before treatment "she could but splash water in her face to wash, she was now able to perform this act with comparative ease". After a week, despite the continued oral administration of the drug, she reported that she was becoming stiff again. Accordingly prostigmin was given subcutaneously on alternate days as well as orally every day. At the time of writing the patient had been under treatment for some ten weeks and had improved slowly and continuously. Trommer and Cohen proposed to continue with the same treatment until no further improvement was manifest, when they would endeavour to establish a maintenance dose. An even more striking case was that of a woman whose spine was rigid and whose limbs were flexed and fixed so that she had almost the attitude of a *fœtus in utero*. Within fifteen minutes of the injection of prostigmin the right knee could be extended from a flexion of 90° to 130°. After further treatment over a period she was able to get out of bed and into a wheel chair without assistance, wash herself, comb her hair, and place her hands behind her head.

Trommer and Cohen point out that prostigmin has no direct effect in rheumatoid arthritis beyond the relief of muscular spasm and associated pain. It has no effect on the pain caused by the lesions of the joints. When the spasm is relieved both active and passive movements can be carried out with less pain. The effect of the injection of prostigmin occurs within a few minutes and may persist for several days.

Trommer and Cohen remind clinicians of something that is apt to be overlooked, namely, that muscular spasm may cause deformity in rheumatoid arthritis. Relief of the spasm will reduce the deformity. Prostigmin is worth trying with the object of obtaining this relief. It might be pointed out, however, that the spasm or rather hypertonicity of muscle is a natural means of protection, and there are cases in which its abolition may not be to the patient's advantage.

[1] *The Journal of the American Medical Association*, Volume CXVII, November 1, 1941, page 1525.

[1] *The Journal of the American Medical Association*, April 29, 1944.

Abstracts from Medical Literature.

OPHTHALMOLOGY.

Pupillary Reflex to Darkness.

O. LOWENSTEIN AND I. GIVNER (*Archives of Ophthalmology*, November, 1943) have observed, in a patient subjected to operation for pinealoma, a dissociation between the reflex to light and that to darkness. They were unable with precision to localize the lesion in the pathways of the light reflex, since no anatomical evidence was available. They affirm, however, that there must exist at least one point in the brain at which the pathways of the reflexes to light and to darkness are not identical. This dissociation between the reflexes to light and darkness is not a universal characteristic of the non-syphilitic Argyll-Robertson phenomenon; it was not found in a case of Argyll-Robertson phenomenon due to a tumour of the superior colliculus.

Myopia with Convergent Strabismus.

R. C. GAMBLE (*American Journal of Ophthalmology*, February, 1944) has studied the association of strabismus with myopia in children. He has found that a high degree of congenital myopia and convergent strabismus often occur in combination. The myopia is lenticular in origin and relatively non-progressive, at least up to the age of adolescence. The convergent strabismus is of low degree; it is usually corrected by the provision of spectacles, and is relatively unimportant.

Retinitis Treated by Pilocarpine and Thyreoid Extract.

A. LANDAU AND J. RUSZKOWSKI (*The British Journal of Ophthalmology*, April, 1944) report a case of exudative and hæmorrhagic retinitis associated with increased intraocular tension, in which treatment by thyreoid extract and pilocarpine was finally successful in controlling the condition. The patient was an apparently healthy woman, aged forty years, who had previously lost the right eye. Investigations forced the authors to the conclusion that the condition was one of arteriolitis of unknown origin, since the patient's blood pressure was normal. Protein shock therapy was tried, but had to be abandoned. The authors then recalled old research work of the French school, which had revealed that exudative patches of retinitis contained many lipoids, especially cholesterol esters, and that such retinitis was associated with hypercholesterolæmia. The patient's blood cholesterol content was found to be at the upper limit of normal, and her basal metabolic rate was estimated at −10%. It was therefore thought that thyreoid treatment was indicated. From the beginning of such treatment her vision began to improve, slowly but steadily. She had no more glaucoma attacks. Her weight was fixed, her basal metabolic rate did not alter, and in order to avoid the general action of thyreoid extract she was given 0·5 grain of phenobarbitone twice a day. For three months the thyreoid treatment was discontinued; during this period she was given six injections of acetylcholine, which were followed by abdominal cramps, and for many weeks afterwards she was given nicotinic acid because of its vasodilatory action. Thyreoid treatment was then recommended, 1·0 grain being taken every second day, and phenobarbitone was given also. The condition of the left eye improved; the hæmorrhages disappeared, as did the exudates in the fundus. The intraocular tension became normal with only one instillation of pilocarpine per day. Vision increased to $^{6}/_{12}$. The patient is still under supervision.

Meningococcal Conjunctivitis.

R. D. REID AND L. H. BRONSTEIN (*The Journal of the American Medical Association*, March 11, 1944) report a case of meningococcal conjunctivitis. The patient was a child, aged two years, who was examined because of the presence of purulent conjunctivitis of the right eye. Examination of a smear from the exudate disclosed Gram-negative diplococci, and the child was admitted to hospital and treated with sulphathiazole by mouth and irrigation of the conjunctival sac with boric acid solution. In the meantime a cultural examination of the exudate had been begun, and this resulted in the growth of a meningococcus. The child recovered rapidly and was discharged from hospital on the third day; the authors point out that at no time was there any evidence of systemic infection. The occurrence of meningococcal conjunctivitis in the absence of infection of other tissues is rare. As in all adequately described cases that the authors were able to find in the literature, in the present case the mode of onset was a respiratory infection. They point out that when Gram-negative intracellular and extracellular diplococci are found in a smear from the conjunctiva affected by purulent conjunctivitis, the presumptive diagnosis of gonorrhœal ophthalmia is almost universally made, and except in rare cases no detailed bacteriological or serological studies of the organisms have been made. They urge that the diagnosis of meningococcal conjunctivitis should be suspected when Gram-negative intracellular diplococci are found in smears of pus in cases in which no obvious source of the infection is discernible.

Hyperpyrexia in the Treatment of Acute Ocular Inflammation.

H. C. KNIGHT, M. EMORY AND N. CALLAHAN (*American Journal of Ophthalmology*, April, 1944) state that the treatment of acute inflammatory diseases of the eye covers three phases: (i) standard ophthalmological treatment, including local therapy and chemotherapy; (ii) the location and elimination of foci of infection; (iii) pyretotherapy. The last-mentioned usually consists of the administration of frequent injections of some pyretogenic agent, and in severe cases the mild febrile response is generally insufficient to be of much value. Only a few patients are given the benefit of the intensive and prolonged therapeutic fever obtained with the hypertherm. The authors have found the results of such treatment in many cases to be excellent, and to offer the only means of saving partial or total vision. They stress the fact that none of the various inflammatory diseases treated by them was of syphilitic origin. The most striking immediate result of hypertherm treatment is relief of pain. The restoration of vision is slightly more delayed, but it is in most cases remarkable. It depends on three factors: (i) the duration of the process before treatment is begun; (ii) the number of treatments given; (iii) the close cooperation of the ophthalmologist, first in persisting in the local treatment, and secondly in determining the point at which treatment is to be discontinued. The authors are convinced that much vision may be saved by this method of treatment, and they are equally convinced that it is not applied as much as possible, even when it is available.

Neurofibroma of the Chorioid.

P. D. TREVOR-ROPER (*The British Journal of Ophthalmology*, April, 1944) reports a case of neurofibroma of the chorioid. The patient was a female child, aged three and a half years, who was well in every respect except for increasing prominence of the left eye of four months' duration. The left orbit was explored, the conjunctiva being divided between the superior and external recti; a firm, circumscribed tumour was exposed, which extended back from the sclera towards the apex of the orbit. Transillumination showed the detachment to be opaque, and exenteration of the orbit was performed. The socket healed well, and no further trouble was experienced. The author points out the rarity of the condition; he was able to find only six recorded cases, and none of the patients was aged under twelve years. He describes the histological features of the tumour.

Naphthocaine in Ophthalmology.

R. A. STEWART (*American Journal of Ophthalmology*, February, 1944), from the results obtained in 53 cases, believes that naphthocaine is the best drug for obtaining local anæsthesia in ophthalmology. In the cases reported, thirteen different surgical procedures were performed. The author states that the striking features of the local use of naphthocaine are its immediate anæsthetic effect after injection, the excellent akinesia it produces, the true anæsthesia during the operation and the long duration of the anæsthesia. Although naphthocaine works best when injected, it has a good anæsthetic effect when instilled; by its use corneal foreign bodies can be removed and tonometry and other minor procedures can be carried out without pain to the patient. When naphthocaine is injected into the lachrymal sac by way of the canaliculus, lachrymal probing can be performed with little discomfort to the patient. In the cases reported no toxic symptoms developed, nor was any appreciable change detected in the pulse or respiration rate or the blood pressure.

Ocular Changes after Typhus Vaccine Injections.

E. F. EAGAN AND H. J. HALPERN (*Archives of Ophthalmology*, April, 1944) report a case, which they believe to be unique, of iritis, retinal hæmorrhage and lenticular changes following the injection of one cubic centimetre of typhus vaccine. Thirty-six hours after the injection the patient noticed that his right eye was red and painful. A diagnosis of iritis was made and suit-

able treatment was instituted; but one week later he complained that vision in the affected eye had almost gone. The left eye remained normal. When the right eye was examined, light perception was absent; the eyelids, cornea and conjunctiva were normal; ocular tension was 18 millimetres. The pupil was dilated and failed to respond. The iris was bound down to the lens at the 12, 5 and 8 o'clock positions. Many small deposits of iris pigment were found on the anterior surface of the lens. The vitreous was cloudy. Examination of the fundus, which was difficult to see, revealed only two or three vessels. The disk was not clearly seen, but over the area of the disk was a large, whitish patch resembling exudate, which extended temporarily to cover the macular area. Because of the hazy vitreous, no other details could be made out. Complete physical examination of the patient failed to reveal any abnormality. The authors state that, although no follow-up examination was made, the extensive permanent damage to the retina will certainly result in loss of vision in the eye.

Di-n-butylcarbaminoylcholine Sulphate.

K. C. SWAN AND N. G. WHITE (*Archives of Ophthalmology*, April, 1944) report the results of work leading to the synthesis of a new class of choline esters with mydriatic and cycloplegic properties. They believe that of these drugs, di-n-butylcarbaminoylcholine sulphate most nearly meets the ideal requirements for use in cycloplegic refractions and routine internal examination of the eye. Although it is less potent than homatropine in equal doses, the new drug has several advantages—notably, shorter action and negligible systemic effects after ocular administration.

OTO-RHINO-LARYNGOLOGY.

Intravenously Induced Anæsthesia for Operations on the Larynx under Direct Laryngoscopy.

B. C. ADAMS, G. B. NEW, J. S. LUNDY AND T. H. SELDON (*Archives of Otolaryngology*, March, 1944) state that as it is frequently necessary to use the electrocautery or diathermy in treatment of the larynx, ether and other inflammable anæsthetics are potentially dangerous. With intravenously administered anæsthetics alone it is found that the depth of anæsthesia required to produce relaxation of the vocal cords is such that grave respiratory depression is induced. At the Mayo Clinic the authors have found that the disadvantages are largely circumvented by topical application of a surface anæsthetic to the glottis and by intrapharyngeal insufflation of oxygen throughout the course of intravenous administration of an anæsthetic. Preoperative sedation with morphine and barbiturates is employed. The oropharynx, hypopharynx and glottis are sprayed and swabbed systematically with 10% cocaine solution until reflex activity is largely interrupted. Four to six cubic centimetres of 2·5% "Pentothal Sodium" solution are next injected intravenously, and, when the patient is asleep and the jaw muscles are relaxed, an intrapharyngeal tube is passed by the nasal route. This tube extends into the oro-pharynx, but not so far down as to obstruct the surgeon's field of vision. Oxygen through the tube is delivered throughout the operation. Additional amounts of two or three cubic centimetres of "Pentothal Sodium" solution may be injected, as are found necessary to maintain relaxation. The average dose ranges between 1·0 and 1·5 grammes, the total dose rarely exceeding 2·0 grammes of "Pentothal Sodium" in any instance. The need for a skilled anæsthetist in these procedures is stressed.

Blast Injury of the Ears.

L. E. SILCOX AND H. P. SCHENCK (*Archives of Otolaryngology*, May, 1944) state that as many suffered bodily injuries too serious to permit extensive study of the ears to be made, it was impossible to give exact figures of the numbers with serious ear injuries; nevertheless, of 1,922 patients with surgical injuries treated on a United States hospital ship in the Solomons campaign, 82 or 4·2% had blast injuries to the ears serious enough to warrant otological study. The commonest lesion was rupture of the tympanic membrane, while traumatic deafness was almost always present, but in varying degree. There appeared to be a dangerous critical distance surrounding the source of blast waves, the distance in air being estimated as up to twenty feet, and in water to approximately eighty feet. A subject caught unaware of impending blast appears to be more prone to aural injury. It is known that blast pressures reach maximum intensity in a much shorter time than the latent period of reflex response of the *tensor tympani* and stapedius muscles, so that reflex muscular action to provide protection for the cochlea is usually impossible. The degree of deafness produced was often found to be greater when the tympanic membrane remained intact than when it was ruptured. Apparently in giving way the membrane absorbs much of the explosive force. In the writers' experience maximum recovery of hearing takes place within two weeks; after that residual loss is usually permanent. In the majority of audiograms of patients subject to blast the greatest loss was in the highest frequencies, contrasting with the tonal dip of 4,096 cycles commonly seen in those exposed to repeated excessive sound. Data as to the value of obturators is not supplied, but the authors remark that plugging of the external canals has been found to be effective against blast waves.

Vascular Polypus of the Vocal Cord.

M. C. MYERSON (*Archives of Otolaryngology*, March, 1944) states that the small, almost invariably single, sessile or pedunculated polypus is the commonest growth arising from the vocal cord. Its origin is stated to be the result of trauma in the form of strain or abuse of the voice in the presence of chronic local inflammation. In up to 75% of cases the patients are males. The age incidence ranges between 17 and 70 years. Vascular polypus is never seen on the vocal cords of children. The location is almost exclusively on the anterior third of the cord. In eight of 110 cases there was a similar formation on both cords, and in seventeen cases the polypus was in the anterior commissure. The little tumour is commonly of reddish-blue or cherry-red colour. Microscopically there is a loosely attached covering of epithelium of varying thickness, while the main mass of the tumour is made up of one or more cavernous endothelium-lined spaces, filled with blood. The stroma may be of a myxomatous appearance, with fibroblast cells predominating. Hoarseness, vocal fatigue and the sensation of a foreign body are the usual symptoms. Cough and dyspnœa are uncommon. Frequently the condition is symptomless. Vocal nodule, carcinoma, papilloma, tuberculoma, and œdematous fibroma are to be considered in the differential diagnosis. The author is of the opinion that vascular polypus has no tendency to malignant metaplasia, but he considers that removal should be recommended in all cases. Thyreotomy is never necessary, as removal is readily accomplished by means of indirect or direct laryngoscopy. Recurrence is rare.

Congenital Laryngeal Stridor.

LEO SCHWARTZ (*Archives of Otolaryngology*, May, 1944) demonstrates by means of direct motion-picture photographs that stridor and inspiratory dyspnœa are produced by infolding of the lateral edges of the epiglottis, the aryepiglottic folds and the flabby soft tissue overlying the arytenoids. By holding the epiglottis forward it is shown in the photographs that the vocal cords and glottic chink are quite normal. Since a micrognathic, or unduly short, mandible is found in infants with congenital laryngeal stridor, it is concluded by the author that the aryepiglottic indrawing is rendered possible by the lack of adequate forward pull by the shorter and correspondingly less tense supporting fibro-muscular structures which ultimately are suspended from the inner aspect of the *symphysis mandibuli*. The author reports relief of obstruction in one child following the punching out of a V-shaped segment of cartilage from the mid-point of the free edge of the epiglottis.

Papillomatosis of the Larynx in Childhood.

C. F. FERGUSON AND H. W. SCOTT (*The New England Journal of Medicine*, April 20, 1944) write on papillomatosis in childhood. Fifteen patients treated at the Children's Hospital, Boston, form the basis of the report. The rate of incidence was one in 6,000 of outpatient children. In only one instance were the symptoms noticeable from birth. In no case was there any familial incidence of the disease. No conclusions can be drawn concerning specific ætiology. Repeated careful peroral superficial excision, with tracheotomy reserved only for cases of severe obstruction, is the treatment recommended. Radium or X-ray therapy is not without danger. No change was observed in one case after six to seven months of local œstrogen therapy. In most cases the disease is self-limited, although repeated excision may be required in the intervening years.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held at the Royal Prince Alfred Hospital on May 18, 1944. The meeting took the form of a series of clinical demonstrations by members of the honorary medical staff of the hospital. Part of this report was published in the issue of September 9, 1944.

Unreduced Malunited Colles's Fracture.

DR. D. A. HUGHES showed a male patient to illustrate the use of operation for correction of an unreduced, malunited Colles's fracture. Five months prior to operation the patient had sustained a Colles's fracture, which was not reduced and had united with pronounced dorsal displacement of the lower radial fragment. Considerable obvious bony deformity was present and only faint wrist movement was possible. A median nerve palsy was also present. Osteotomy was performed transversely through the site of fracture. A piece of bone was taken from along the lower 1·5 inches of the shaft of the ulna, and this was shaped into a wedge and placed in the line of the osteotomy incision so as to correct the deformity. At the time of the meeting (four months after operation) the patient had just discarded his plaster cast, and X-ray examination revealed bony union between the graft and the radius. Dr. Hughes said that the patient now had a wrist with no external deformity, and it was likely that he would regain an appreciable amount of wrist movement. The operation was considered advisable in view of the gross deformity, the correction of which would give a stronger and more useful wrist and would also improve the range of movement. The median nerve palsy was subsiding.

Impacted Fractures of the Necks of Metacarpals.

Dr. Hughes then showed a series of X-ray films showing the treatment of impacted fractures of the necks of metacarpal bones, those of the thumb excluded. The series of fractures had been treated without any reduction of the deformity, which was usually that producing dorsal angular convexity at the site of fracture. A short volar cock-up splint was applied to the forearm and wrist, the fingers being left free to move. The splint was applied merely to prevent the patient from using his hand too much. Immediate hot air or infra-red therapy and active finger movements were instituted. The average time before full movements of the metacarpo-phalangeal and interphalangeal joints was regained was nineteen days. X-ray films taken after three weeks revealed firm callus in all cases. Dr. Hughes said that by this method full finger movement was obtained in much less time than by the routine method of reduction of fractures and splinting. The only ensuing external deformity was the loss of prominence of the "knuckle". The presence of the unreduced dorsal angular convexity at the site of fracture in no case prevented the return of perfect function.

Fracture-Dislocation of the Thumb Metacarpal.

Dr. Hughes next showed a patient to illustrate the treatment of fracture-dislocation of the base of the thumb metacarpal. A loop of stainless steel wire had been inserted through the pulp of the thumb, and traction had been applied by means of a wire and a screw hook, the wire being incorporated in a plaster cast which extended from the middle of the forearm to the palm. This traction kept the dislocation reduced, and was maintained with the thumb in three-quarter abduction for three weeks. At the end of that time the dislocation was stable, and early callus was present in the fractured base of the metacarpal. Active movements were then begun. At the end of eight weeks full movements of the thumb had returned.

Fusion of the Radial Epiphysis.

Dr. Hughes's next patient was a girl, aged ten years, who had had radium treatment to a nævus situated in the skin at the lower end of the radius. This caused fusion of the radial epiphysis. Four years later the increasing length of the ulna as compared with the radius caused marked radial deviation of the hand. Accordingly a step-cut was performed at the mid-shaft of the ulna to shorten the bone. At the time of the meeting the arm was still in a plaster splint.

Multiple Osteochondromatosis of the Ankle.

Dr. Hughes finally showed a man, aged thirty-eight years, who had presented himself at the out-patient department complaining of a slightly swollen and slightly painful ankle. X-ray examination revealed many small loose bodies about one-eighth of an inch in diameter packed into the ankle joint in all its aspects. As the condition caused only slight disability, operative removal was not advised, but was to be attempted if the joint became too painful.

Addison's Disease.

DR. ROBERT STEEL showed a female patient, aged fifty-five years, suffering from Addison's disease. She complained of tiredness of three years' duration, of gradual darkening of the skin for the past two years, and of a slight cough with a small amount of purulent sputum present during the last three months. Brown pigmentation was present on the face, neck, arms and legs; no increased pigmentation was noticed on the trunk or mucous membrane. Clinical examination of the heart, lungs and abdomen revealed no abnormality. The systolic blood pressure was 110 millimetres of mercury and the diastolic pressure 60. X-ray examination of the lungs revealed no evidence of tuberculosis. An oblique X-ray film of the abdomen revealed no abnormality. A blood count revealed that the erythrocytes numbered 3,280,000 per cubic millimetre. The chloride content of the blood was 614 milligrammes *per centum*. The basal metabolic rate was −12%. Treatment with "Eschatin", two cubic centimetres per day, was carried out for two weeks; "Eschatin" was given subcutaneously, and ten grammes of sodium chloride were administered by mouth each day. The pigmentation became less, the appetite improved and the lassitude disappeared. The patient was discharged from hospital after six weeks with a recommendation to have two cubic centimetres of "Eschatin" every two weeks and ten grammes of sodium chloride per day. Six weeks after her discharge from hospital she complained of loss of weight, increased pigmentation and vomiting for a period of three weeks. The systolic blood pressure was then found to be 90 millimetres of mercury and the diastolic pressure 60. It was found that the patient had not been taking sodium chloride. It was also evident that the dose of "Eschatin" was inadequate. She was readmitted to hospital with pronounced pigmentation on the areas previously stated, but the pigmentation was much darker. Two cubic centimetres of "Eschatin" were given per day and one drachm of sodium chloride was given three times a day; the vomiting ceased at once. Dr. Steel said that the interesting feature in this case was the rapidity with which the pigmentation faded on the patient's readmission to hospital; in three weeks it had practically disappeared.

Lymphosarcoma.

Dr. Steel next showed a female patient, aged fifty-one years, suffering from lymphosarcoma. The patient had complained of lumps in the neck, present for six months, and of tiredness of one month's duration. Two years earlier a swelling of the glands on the left side of the neck was noticed; but the swelling subsided, recurring six months prior to the meeting. Great fatigability was noticed one month before her admission to hospital.

On examination, the patient was somewhat pale. The glands in the posterior triangle of the left side of the neck varied in size from that of a pea to that of a walnut; they were of firm consistency, movable on the deeper structures and not attached to the skin. In both axillæ glands of similar size were palpable, but larger glands were present on the left side. A few small glands were present in the groins. The spleen was palpable one and a half inches below the left costal margin. X-ray examination of the chest revealed no evidence of enlargement of the mediastinal glands. A blood count gave the following information: the erythrocytes numbered 3,290,000 per cubic millimetre, the hæmoglobin value was 55% and the leucocytes numbered 5,100 per cubic millimetre. A biopsy suggested the diagnosis of lymphosarcoma.

Deep X-ray therapy was carried out by Dr. H. J. Ham. The glands decreased remarkably in size and the patient felt well. At the conclusion of the deep X-ray therapy severe secondary anæmia developed, but that was easily rectified by an iron mixture given orally.

Paget's Disease of the Skull.

Dr. Steel also showed an X-ray film of the skull of a female patient, aged sixty-two years, who suffered from

advanced Paget's disease of the skull. She complained of anorexia, sore tongue, abdominal discomfort, loss of weight and weakness of six months' duration. On examination, the heart was found to be slightly enlarged, and the sounds approached one another in intensity. The systolic blood pressure was 200 millimetres of mercury and the diastolic pressure 110 millimetres. At no time did the patient complain of headache.

Dr. Steel said that the remarkable feature of the case was that, in spite of the advanced Paget's disease of the skull and the hypertension, there were no symptoms of headache. The Paget's disease had been discovered accidentally, when the skull was radiologically examined after a slight injury.

Lipoma of the Forearm.

DR. A. S. JOHNSON showed a male patient, aged forty-nine years, who had had a swelling of the upper part of the right forearm for about three years. There had been some increase in size during the past six months, but no pain nor other symptoms except a feeling of weakness in the forearm after strenuous use. On examination, a diffuse swelling was found over the upper third of the forearm towards the radial side; it appeared to be deep to the muscles, was hard and not tender, and the muscles were slightly movable over it. An X-ray examination revealed a small radiating exostosis arising from the upper third of the right radius; this exostosis was surrounded by a distinct clear dark area of curious appearance. The radiologist reported the presence of an exostosis with probable associated chondroma. Operation was performed, and a moderately large lobulated lipoma was found lying deep to all the muscles and closely investing the upper part of the radius. A small radiating exostosis was extending into the lipoma, and this was removed together with the main tumour. Dr. Johnson said that the lesion was an example of parosteal lipoma, the exostosis appearing probably as a secondary irritative effect.

Giant Papilloma of the Rectum.

Dr. Johnson's second patient was a female, aged sixty-two years, who had been admitted to hospital in November, 1943. She gave a history of intermittent watery discharge *per rectum* of two years' duration; the discharge had become persistent during the previous two months and was associated with mucus and sometimes blood. She had also noticed a feeling of fullness and some pain in the rectum during defæcation.

On rectal examination, a rather soft mass could be felt, chiefly on the anterior and lateral walls of the rectum, about three or four inches from the anal orifice. A sigmoidoscopic examination revealed a cauliflower-like tumour on the rectal wall, and a biopsy was taken. Pathological examination revealed a luxuriant proliferation of glandular epithelium indicative of active papilloma. The tumour covered a wide area of rectal wall, making any possibility of local removal out of the question, and in view of the symptoms and the possibility of subsequent malignant changes, it was decided that perineal excision of the rectum was the best form of treatment.

A left inguinal colostomy was established on November 3, 1943, a loop of sigmoid colon being brought out over a glass rod. On November 24 perineal excision of the rectum was performed under spinal anæsthesia supplemented with nitrous oxide and oxygen, and about nine inches of the rectum and the lower portion of the sigmoid colon were removed. After recovery from the inital shock, aided by blood transfusion, the patient made good progress; but a delay had occurred in complete healing of the perineal wound. It was found that on occasions fæcal matter was present in the discharge from this wound. On February 2, 1944, under anæsthesia induced by the intravenous administration of "Pentothal", the colostomy was examined, the bowel was divided by diathermy and the skin was sutured between the proximal and distal openings. Subsequent to this progress was steady, and the perineal wound was completely healed at the end of April, 1944.

Dr. Johnson said that pathological examination of the tumour after operation showed it to be a papillomatous cauliflower-like growth commencing at a level six centimetres above the anal sphincter, extending five centimetres in a vertical direction, and approximately extending around the greater part of the circumference of the rectum. Microscopically, the picture was that of a hyperplastic papilloma. He said that the case was of interest as an illustration of this type of benign giant villous papilloma of the rectum, and also of the difficulty sometimes encountered in securing healing of a perineal wound after resection, aggravated in this case by escape of some fæcal matter into the distal loop over the single-barrelled colostomy.

(To be continued.)

NOTICE.

THE General Secretary of the Federal Council of the British Medical Association in Australia has announced that the following medical practitioners have been released from full-time duty with His Majesty's Forces and have resumed civil practice as from the dates mentioned:

Dr. R. C. Geeves, 18, Yarrara Road, Pennant Hills, New South Wales.
Dr. H. W. Johnson, Ballow Chambers, Wickham Terrace, Brisbane (March 6, 1944).
Dr. D. G. Croll, Sherwood, Brisbane (July 31, 1944).
Dr. E. Murphy, "Inchcolm", Wickham Terrace, Brisbane (May 1, 1944).
Dr. C. M. Burns, 154, Hopetoun Avenue, Vaucluse, New South Wales (September 11, 1944).

Correspondence.

USE OF X-RAY FILM AFTER EXCISION OF A JOINT.

SIR: Two months ago I removed a big toe joint, the seat of osteoarthritis and destruction of cartilage, so painful as to interfere with the patient's occupation.

The extensor tendon was shortened, a piece of X-ray film inserted between the metatarsal and the phalanx, and the flexor tendon shortened. The skin suture line was distal to the level of the new joint.

The toe is now painless, the movement strong and controlled, and there is no reaction of the tissues to the X-ray film.

Yours, etc.,

E. A. JOSKE.

Balaklava,
South Australia,
August 6, 1944.

A CASE OF BUPHTHALMOS.

SIR: Buphthalmos, or hydrophthalmos as it is better termed, or infantile glaucoma, happily, is rare. In the very few that I have met with, trephining has failed to arrest the disease, by reason of it always becoming blocked.

The following is my only successful case, and it was treated by the method of Lagrange.

Bruce M., aged two, was brought to me eight years ago with a typical enlarged, hard eye, which was unfortunately also blind, with optic atrophy. I trephined it with the hope of preventing further enlargement and disfigurement. I did not see him again for two years, as they lived in the country. The drainage had failed and the eye was as hard as ever. I then did a Lagrange at the temporal limbus. I have seen him at intervals since, and the tension has always been normal. I saw him recently, when he was ten years old. The tension remains normal (20 millimetres of mercury), and the eye has ceased to enlarge. When I have done a canthoplasty, to narrow the palpebral aperture, the disfigurement will be hardly noticeable.

Dr. Ringland Anderson, in his excellent and monumental monograph "Hydrophthalmos", on page 318 quotes Lagrange: "In the early stage especially, trephining is not only contra-indicated, but is a dangerous procedure." In my limited experience it is also futile. However, he further quotes de Lapersonne: "It is prudent to resort to the trephine if one has not learned how to do a sclerectomy according to the method of Lagrange or Holth."

Yours, etc.,

E. TEMPLE SMITH.

Locarno,
141, Macquarie Street,
Sydney.
August 17, 1944.

A TIME-SAVING MASTOIDECTOMY DRESSING.

SIR: In his letter to THE MEDICAL JOURNAL OF AUSTRALIA of July 1, 1944, Dr. Halford points out another advantage (namely, the flat non-depressed scar obtained) of the method of dressing mastoidectomy wounds which I advocated in the journal of May 27, 1944.

In this article, I particularly stressed what seemed the most important of the advantages gained by this method—the complete healing of the wound in a much shorter time than in the case of the usual dressing. However, there are other and almost as important advantages, and these I have listed hereunder:

1. The final appearance of the healed wound. The resultant scar is flat and thin and non-depressed, a distinct improvement on the depressed wide and ugly scar which often follows the use of packing. Of the nine cases I reported only one resulted in a scar that was at all depressed, and that was Number 5 in the series, the expected exception to the rule.

2. The absence of painful post-operative dressings which were a feature of the old packing method. An anæsthetic was often needed for the first dressing, particularly in children. The new method of dressing can be done without occasioning any pain to the patient at all.

3. A considerable saving in the surgeon's time. In most cases only two complete dressings need to be done in the whole duration of the healing—on the third and sixth days.

Dr. Halford asks about the progress of the healing in wounds treated in this way. I agree that it is most surprising and gratifying when compared with the old packing method. The bony wounds which previously discharged for weeks afterwards, now mostly dry up in a few days. The outer dressings usually require changing because of soakage of discharge only in the first three days; thereafter they usually remain dry. In most cases the dressing done on the sixth day is most illuminating—the wound is almost healed, only the lower end having a small red granulating surface with a little sticky exudate on the gauze surmounting it—more serous than purulent. From then on till the fourteenth day there is usually no need to touch even the outer layers of gauze. Actually most of these wounds are healed by the tenth day, but I have suggested the fourteen days to give a routine applicable to all cases.

Dr. Blashki mentions in his letter that he uses a glass drainage tube instead of a rubber one (which I mentioned in my article as an advance on packing). Certainly I consider his method is better than that of packing the cavity, and also probably of using rubber tubes, but it will not, of course, exclude secondary infection, and this probably is the cause of the longer healing time of his wounds. I think Dr. Blashki missed one of the points of my article that in an army hospital the patient must be retained till the wound is completely healed, the ear dry and the patient can be sent to duty without any dressings on his head. In the article appearing under his name in April, 1941, he states that the patient stays on an average in hospital for fourteen to fifteen days, and is then sent out when out-patient treatment is considered suitable—he does not say how long the patient continues to attend the out-patient department. In my series (excluding the chronics which are an unfair test of any method and the case that was an expected exception), all cases went back to their units in fourteen days, except one which took twenty-one days. In civilian conditions nearly all these cases would have been out of hospital on the eighth or ninth day.

Dr. Blashki will possibly continue to prefer his method and I to prefer mine; but looking at the problem impersonally, the efficacy of either method should be judged not by the date of introduction, but by the results obtained; actually mine is a most modern application of Lister's ideas, and should supersede all packing or tube-drainage methods. Admittedly mine was a small series of cases, but the number in which my method is used is slowly growing, and each new case is serving only to confirm my previous opinion that this method is preferable to ones in which rubber or glass tube drainage is used, both from the point of view of time-saving and that of comfort to the patient.

Yours, etc.,

J. R. HUTCHEON,
Major, Australian Army Medical Corps.

An Australian General Hospital,
August 21, 1944.

WANTED: A MEDICAL HISTORIAN.

SIR: It is not sufficiently recognized that an event which happened ten seconds ago is history. Your recent leader on the need for the appointment of a historian is opportune. Already he will have years of history to record, and with each month priceless opportunities of obtaining information are lost. It must be remembered that the higher posts in the medical service were filled by those who, whilst giving us the experience of age, have handicaps which follow in its train. Some on returning to civil life have already "passed over". Their assistance in the unravelling of details has been lost for all time.

The early appointment of a medical historian for our war activities is the sole means of preventing future losses.

Trusting that your advice will have results.

Yours, etc.,

JOHN BOSTOCK.

Brisbane Clinic,
Wickham Terrace,
Brisbane.
September 1, 1944.

A NATIONAL MEDICAL SERVICE.

SIR: Like Dr. Lance Hewitt (THE MEDICAL JOURNAL OF AUSTRALIA, August 12, 1944), I have of late been thinking of the doctor and his money in any forthcoming national medical service. Of course, the sordid subject can only be discussed in detail when the actual shape of things to come is known. Meanwhile some general thinking and discussion on this subject will not go amiss.

When the day arrives for negotiating this matter, will the Federal Council have a prepared basis for bargaining? Or will it wait for the Government to say: "Well, what do you fellows want?" To which the Council might reply: "What about £1,500 a year for the average busy general practitioner, on whom all calculations must be based?" "Nothing doing", the Government would say, "we will give him £800." Agreement might be reached on £1,200. Well, £1,200 may be a reasonable figure. So may the Government's £800. So may Dr. Hewitt's calculations. However, these are only arbitrary estimates of the worth of the doctor to the community. Have we anything more fundamental to work upon; a recognized yard-stick for the measurement of such things? The income of a large proportion of the population is determined by the principles governing industrial arbitration. Let us apply it to the medical practitioner by way of experiment.

Whatever amelioration of our lot the future may hold, any present calculations must be made on the general practitioner as we have known him in the past. When he enters his promised land of leisure and fixed hours suitable adjustments could be made. In the meantime we find carpenters and electric welders receive something over £7 for a forty-hour week and coalminers from £8 to £10 for something under a forty-hour week. Let us claim £12 a week for our general practitioner's forty-hour week. This gives him an hourly rate of 6s. Naturally he will be entitled to "time and a half" for ordinary overtime and "double time" for week-ends and holidays. Also he could make a reasonable claim for a special margin on account of the peculiar hazards and disabilities of his calling, just as the miner or lumper get an extra rate for wet, dusty or other uncongenial working condition. There is his long and expensive training and the late age at which he commences to earn a living. There is his unenviable position of second or third from the bottom of the expectation of life tables. A formidable list of personal hazards and unsavoury working conditions could be prepared. Suppose, then, we allow him an extra 1s. an hour in recognition of these disabilities. On this "award" his weekly wage works out thus, assuming his average day is from 8 a.m. to 9 p.m. and that he works six hours on Saturday and four on Sunday:

	£	s.	d.
Monday to Friday (65 hours)—			
40 hours at 7s.	14	0	0
25 hours at 10s. 6d.	13	2	6
Saturday—			
3 hours in morning at 7s.	1	1	0
3 hours in afternoon at 14s.	2	2	0
Sunday—			
4 hours at 14s.	2	16	0
	£33	1	6

This amounts to £1,720 a year. For overtime on public holidays add, say, £30, giving a total net income of £1,750. Should the private basis of general practice be allowed to remain, there must be added, say, £550 for running expenses and £200 a year to be set aside to provide nine to twelve months' post-graduate work every five years. This gives a gross income of £2,500.

My trade unionist friends say this reasoning is perfectly sound and justifiable. But they add that the award is "lousy". They consider their doctor is worth a higher rate than that we have allowed him. Also they say he should receive "double time" for anything over twelve hours and anything after midnight. Moreover, the doctor should receive financial recognition of the fact that he is never really off duty and therefore never free to do or go where he pleases. If, then, we were to grant him an hourly rate of 10s., his net income, using the same formula as before, becomes £2,500.

It is not claimed that the above calculations are based on any considerable research of the principles of industrial arbitration, but only that they indicate a mode of bargaining which a Labour Government should respect and one which it may be to our advantage to use.

Yours, etc.,

DONALD COPPING, M.B., B.S.

Collie,
Western Australia,
August 28, 1944.

THE DOCTOR AND THE PRE-SCHOOL CHILD.

SIR: We must thank Professor John Bostock for his words of wisdom in his address, "The Doctor and the Pre-School Child". He has sounded the clarion call—may it be answered. The hope of our nation, indeed the hope of the world, lies in the children. Thus he touched the very basis of our existence. If we are to look towards the possibility of a new world order, then we must begin at the bottom and not at the top. It has been said that there is need of a larger representative body in the Commonwealth, but I ask what real good is this without improving the type and character of individuals who finally are to constitute this body? If we ever are to have industrial peace we must talk with rational individuals and not a lot of irresponsible "spoilt children". Mr. Roosevelt has said how impossible it is to reason with the Nazi youth. This is just the case with our irresponsible citizens. Our chance of securing them as honest, upright human beings has gone forever, for it is only in early infancy that the seed of good character can be truly sown. Our outlook in lots of ways seems to be, "let us build more gaols to house the criminals", instead of training our infants so that they won't need the gaols. Here is one particular point to which attention should be drawn, that is, there is a danger in paying too much attention to the later part of the pre-school age, that is, from two to five years, whereas the far more important part from the mother's point of view is from birth to two years. This is the part which must be left almost solely to the mother, and it is in this age period that I feel a child's character is really made or marred. As Irma Schneirer relates, in her book "Making Childhood Happier", about the mother of a two-year-old child, when consulting her doctor, asked when she should begin the child's education. "You have already missed two years. Your question should have been asked the day he was born", was the answer. We can never hope for any real peace unless we raise the percentage of well-trained children in our community to a far greater level than it is at present, that is, children, to use the popular expression, "who have been well brought up". I asked a long experienced midwife the other day what percentage of children of the mothers she had confined she thought were well trained. Her reply was: "Not more than 50% at the most." So it is no good continuing any longer by treating the symptoms alone, that is, by giving child endowment only, play grounds *et cetera* only; we must go further and treat the condition itself. Educate the parents themselves how to handle their children, particularly from birth to two years, and at the same time lessen their stress of a twenty-four-hour day seven days a week. The one mistake that mothers make most is to take the course of least resistance. They don't worry about little things and little matters of discipline in infant training, probably because their capacity for taking pains has been depleted by weariness and nervous fatigue. But we must remember to look after the pennies and the pounds will look after themselves. Who else but a mother has been asked to carry such a responsibility with so little training and often with little reward? In medicine our training is six years, and yet to the mother who is to lay the foundations of the character of a nation we give none. Surely it would not have been amiss to have included "parent education and the pre-school child" in the Atlantic Charter. It is certainly more important that any of the fourteen points which were set before us at the referendum. It is in fact the very essence of our existence. Certainly every district should have its day nursery. The doctors attending these day nurseries should be selected from those who are both interested in infant training and with an ability to act as one of the instructors in motherhood training. Lack of knowledge in the proper training of infants is not confined to either rich or poor and even doctors are not immune.

In the first place, modern, well-equipped obstetric hospitals must be built in every district with more than ample bed space to avoid overcrowding so that the young mother may be given the chance of a good start. This is absolutely essential. The old order of small private hospitals, "lying in homes", must go forever. I would just like to suggest here a rough outline of a plan for the education of the mothers.

1. Part of the school curriculum in the last two years—elementary.

2. Parent education training schools—particularly for newly married women—in wings attached to the day nursery buildings with a selected supervisor in charge holding both Tresillian and kindergarten certificates.

3. After the mothers leave the obstetric hospital they should go to rest homes: (*a*) For normal cases (*vide* Carpenter Mothercraft Home). (*b*) For abnormal cases (*vide* Tresillian). At both these homes "student mothers" shall be given the practical work of their training. The homes, of course, to be numerous so that they will be able to cope with all the mothers for a period of two weeks after they leave the district obstetric hospitals.

The education of the young mothers would be voluntary, but propaganda should be used on a large scale to bring it into fashion. Government subsidy to be granted in all areas, but in poorer districts the Government to bear the whole financial burden. I can hear a lot of people saying: "Rather a Utopian scheme." However, let us think awhile of the many ways in which our own and our national income is dispersed with none or little return, and I think we will realize that the improvement of individual character is the only real basis of a peaceful and happy world, and so whatever expense is entailed the dividends in the generations to come will be a hundredfold.

I appeal to Professor Bostock and others who are keen to see some machinery for parent education set in action to lead the way and organize us for action. His quotation from Milton reminds me of one from Wordsworth's "Ode on the Intimations of Immortality from Recollections of Early Childhood":

> But trailing clouds of glory do we come
> From God who is our Home:
> Heaven lies about us in our infancy!
> Shades of the prison house begin to close
> Upon the growing boy. . . .

Yours, etc.,

COLIN WARBURTON.

56, Pitt Street,
Mortdale,
New South Wales.
September 2, 1944.

SIR HOWARD FLOREY'S LECTURE IN SYDNEY.

SIR: The Council of the New South Wales Branch of the British Medical Association extends its apologies to those members who were unable to gain entrance to the Union Hall, University of Sydney, on September 7, to hear the lecture by Sir Howard Florey on penicillin. The date of the lecture was determined by the Director-General of Medical Services after consultation with Sir Howard, and immediately on receipt of advice as to the date the Council tried, but without success, to arrange for the use of a large hall. Owing to examinations the university authorities were unable to make the Great Hall available.

Yours, etc.,

J. G. HUNTER,
Medical Secretary, New South Wales Branch of the British Medical Association in Australia.

B.M.A. House,
135, Macquarie Street,
Sydney.
September 11, 1944.

Obituary.

JOHN FULLARTON MACKEDDIE.

We regret to announce the death of Dr. John Fullarton Mackeddie, which occurred on August 31, 1944, at Melbourne.

RANIERI BELLI.

We regret to announce the death of Dr. Ranieri Belli, which occurred on September 6, 1944, at Sydney.

ANDREW WATSON MUNRO.

We regret to announce the death of Dr. Andrew Watson Munro, which occurred on September 7, 1944, at Woollahra, New South Wales.

OTTO BOHRSMANN.

We regret to announce the death of Dr. Otto Bohrsmann, which occurred on September 9, 1944, at Darling Point, New South Wales.

Nominations and Elections.

The undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Cullen, John Thomas, M.B., B.S., 1942 (Univ. Sydney), "Welton", Maud Street, Randwick.

Stapleton, Joseph Edward, M.B., B.S., 1944 (Univ. Sydney), Flat 10, 124, Old South Head Road, Bellevue Hill.

Player, Sydney James William, M.B., B.S., 1944 (Univ. Sydney), 1, Archbold Road, Roseville.

Hatfield, Samuel Bolam, M.B., B.S., 1939 (Univ. Sydney), 11, Roscoe Street, Bondi Beach.

Palmer, Alice Jean, M.B., B.S., 1943 (Univ. Sydney), 8, Goodwin Avenue, Ashfield.

Slattery, Edward Matthew, M.B., B.S., 1944 (Univ. Sydney), Lismore Base Hospital, Lismore.

Lundie, Arthur James, M.B., B.S., 1941 (Univ. Sydney), 15, Lord Street, Roseville.

Kelly, James Lincoln, M.B., B.S., 1944 (Univ. Sydney), 1, Greenknowe Avenue, Potts Point.

Middleton, Lucas William Maxton, M.B., B.S., 1942 (Univ. Sydney), c.o. Dr. C. D. Garnsey, 30, Turramurra Avenue, Turramurra.

Books Received.

"Psychiatry and the War: A Survey of the Significance of Psychiatry and its Relation to Disturbances in Human Behavior to help provide for the Present War Effort and for Post War Needs", edited by Frank J. Sladen, M.D.; 1944. Springfield: Charles C. Thomas. 9" × 6", pp. 526. Price: $5.00.

"Textbook of Histology for Medical Students", by Evelyn E. Hewer, D.Sc. (London); Third Edition; 1944. London: William Heinemann Medical Books Limited. 9¼" × 6¼", pp. 371, with many illustrations. Price: 17s. 6d. net.

"Antenatal and Postnatal Care", by Francis J. Browne, M.D. (Aberdeen), D.Sc., F.R.C.S. (Edinburgh), F.R.C.O.G.; Fifth Edition; 1944. London: J. and A. Churchill Limited. 8" × 5¼", pp. 630, with many illustrations. Price: 24s.

"Regional Analgesia", by H. W. L. Molesworth, F.R.C.S. (England); 1944. London: H. K. Lewis and Company, Limited. 8¼" × 5¼", pp. 96, with many illustrations. Price: 8s. 6d. net.

"After-Treatment: A Guide to General-Practitioners, House-Officers, Ward-Sisters and Dressers in the Care of Patients after Operation", by H. J. B. Atkins, D.M., M.Ch. (Oxon.), F.R.C.S. (England); Second Edition; 1944. London and Melbourne: Macmillan and Company Limited. 8¼" × 5¼", pp. 325, with 60 illustrations. Price: 18s. net.

Diary for the Month.

SEPT. 18.—Victorian Branch, B.M.A.: Hospital Subcommittee.
SEPT. 18.—Victorian Branch, B.M.A.: Finance Subcommittee.
SEPT. 19.—New South Wales Branch, B.M.A.: Medical Politics Committee.
SEPT. 19.—Victorian Branch, B.M.A.: Organization Subcommittee.
SEPT. 20.—Western Australian Branch, B.M.A.: Branch Meeting.
SEPT. 21.—South Australian Branch, B.M.A.: Council Meeting.
SEPT. 21.—Victorian Branch, B.M.A.: Executive Meeting.
SEPT. 21.—New South Wales Branch, B.M.A.: Clinical Meeting.
SEPT. 22.—Queensland Branch, B.M.A.: Council Meeting.
SEPT. 25.—Meeting of the Federal Council, B.M.A., Melbourne.
SEPT. 26.—New South Wales Branch, B.M.A.: Ethics Committee.
SEPT. 27.—Victorian Branch, B.M.A.: Council Meeting.
SEPT. 28.—South Australian Branch, B.M.A.: Scientific Meeting.
SEPT. 28.—New South Wales Branch, B.M.A.: Branch Meeting.
OCT. 3.—New South Wales Branch, B.M.A.: Council Quarterly.
OCT. 4.—Western Australian Branch, B.M.A.: Council Meeting.
OCT. 4.—Victorian Branch, B.M.A.: Branch Meeting.
OCT. 5.—South Australian Branch, B.M.A.: Council Meeting.
OCT. 6.—Queensland Branch, B.M.A.: Branch Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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